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THERMAL EXPOSURE OF AMMUNITION ON BOARD SHIP. PART 2. AIRCRAFT --ETC(U)
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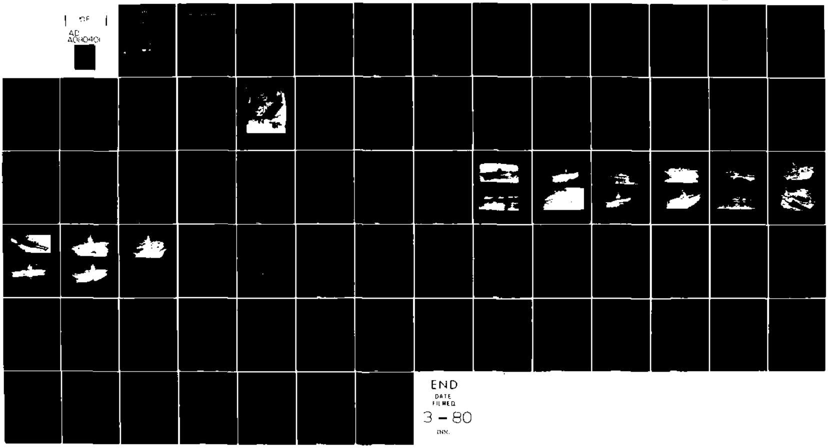

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FOREWORD

This report presents results of an investigation to determine the valid shipboard thermal environment of ammunition. The work was conducted by the Naval Weapons Center (NWC), China Lake, California and supported by the Naval Air Systems Command under AirTask A03W-3300/008B/F31300000.

This report, Part 2, covers the probable thermal exposure to be found on aircraft carriers. The previously published volume, Part 1, covers cruisers and large destroyers. Additional volumes covering other naval ship types will be published at a later date.

This report has been reviewed for technical accuracy by Warren Oshel.

Approved by
C. J. DiPol, *Head*
Range Department
29 June 1979

Under authority of
W. B. HAFF
Capt., U.S. Navy
Commander

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(U) *Thermal Exposure of Ammunition On Board Ship, Part 2. Aircraft Carriers,* by Sakaye Matsuda and Howard C. Schafer, Naval Weapons Center, China Lake, Calif., Naval Weapons Center, July 1979. 68 pp. (NWC TP 4824, Part 2 publication UNCLASSIFIED.)

(U) The magazine air temperature records from CVS and CVA type ships have been statistically analyzed to obtain the probable thermal exposure to be found on these type ships. The information is divided into the temperature expectancies for the various deck levels as applicable. Effort has been made to eliminate information from compartments influenced by the engine room. This report includes more than 1.1 million data points from 17 ships. The ships were assigned to the 1st, 2nd, 6th and 7th Fleets in this time frame.

CONTENTS

INTRODUCTION

An important factor in designing a ship-launched weapon is the environmental temperature range the weapon will experience during storage and operation. As part of a larger program aimed at determining the stockpile-to-target environments that will be experienced by air-launched weapons, a study was undertaken to define the thermal regime as it pertains to shipboard storage and use.

Recording of the maximum and minimum air temperatures in each magazine on board every ship in all Fleets has been required for years. This requirement, however, was strictly for safety; the records were usually retained on board the ship for only 1 to 2 years and then destroyed. At the request of the Naval Weapons Center (NWC), the Chief of Naval Operations in 1967 instructed all Fleet elements to send their obsolete magazine records to NWC for use in this project. Ships from the 1st, 2nd, 6th and 7th Fleets responded to this request, and the information from the cruisers and newer destroyers was reported on in Part 1 of this report series.

This volume, Part 2, presents the data and results as they pertain to aircraft carriers. Eventually all ship classes will be divided into logical study units and similar reports detailing the storage temperatures for each group prepared and published.

More than one million maximum or minimum temperature data points collected from all compartments and lockers on all levels of 17 aircraft carriers have been integrated into this report. The data collection time frame for each ship ranged from a few months to 10 years (for the

U.S.S. Coral Sea). Many of these ships are no longer in service; however, the data are considered valid since all aircraft carrier compartment temperatures tend to describe a very narrow band of exposure. Also, it was thought these obsolete ships data would detail any thermal differences that would exist in future aircraft carrier design, if such tend to exist.

A complete definition of the extreme temperature circumstances is not provided since the exact position of the ship, day by day, is not known. Therefore, it is possible that even with the mass of data presented a chance exposure to less moderate temperatures could be experienced. Also, there was no control over ship deployment or the personnel actually recording the individual temperature readings. The sources of error in the existing collection system, however, have been investigated and compensated for. For example, the measuring instrument, a "horseshoe" thermometer equipped with maximum and minimum temperature tattletales, could be affected by ship vibration. If mounted on a resonating bulkhead, the vibration could shake the tattletales down to the menisci of the mercury. This is evidenced in the records by identical maximum and minimum temperature entries for an interval of several days.

The lack of ship location information for a given day does not invalidate the data obtained since a correlation was made during the investigation on the service temperature of the ASROC missile.[1,2] In this correlation, the recorded sea water temperature was compared with the minimum recorded ASROC motor temperature for the same day. The

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[1] Naval Weapons Center. *Launcher Environment of the ASROC Motor, Part 1. Motor Wall Temperature*, by C.A. Taylor and H.C. Schafer. China Lake, Calif., NWC, June 1967. (NWC TP 4349, Part 1, publication UNCLASSIFIED.)

[2] -----. *Launcher Environment of the ASROC Motor, Part 2. Deck Magazine Temperatures*, by C.A. Taylor and H.C. Schafer. China Lake, Calif., NWC, November 1969. (NWC TP 4349, Part 2, publication UNCLASSIFIED.)

resulting readings were within a few degrees of each other. Since the data were from ships assigned to the 7th Fleet, and this Fleet's area of interest is the Western Pacific, given the month and minimum compartment temperatures, a good guess can be made as to where the ship was located. As indicated in footnotes 1 and 2, the Western Pacific could be the warmest area in which our ships will be required to be deployed. When considering the cold extreme situation, there is a logically self-limiting factor. For instance none of the carriers providing data were in the Beaufort Sea during winter. This sea is ice choked in winter and a carrier would quite possibly be stuck in the ice until the next summer.

During the data accrual period, the candidate ships were deployed between 9 and 20° North latitude in the South China Sea. Thus these data, though incomplete and imperfect, are of extreme value in determining the environmental temperature criteria to which a majority of ship-launched ordnance will be exposed. This work then lays a foundation for determining the aircraft carrier maximum and minimum temperature regime for any non-heat generating naval material so as to be in design compliance with DOD Directive series 4120 and 5000. In addition, these data can be indicative of the "ready strike" thermal regime of ordnance and external stores mounted on aircraft during a combat situation.

As stated above, the data presented herein do not permit the exact correlation of ship location at the time a given temperature was recorded. However, the modern aircraft carrier does not congregate in groups but is usually the sole or paired center of her own task force. Thus each carrier data record is, in fact, the record for a carrier task force. Herein we have a conglomerate record of many independent carrier task forces from which we can derive a good idea of the overwhelming use of carriers (and the resulting compartment temperatures) in both cold and hot extremes. Based on these considerations it can be stated that the probable chance of occurrence of the response temperature of aircraft carrier ordnance and material is herein displayed.

INSTRUMENTATION

The horseshoe-type mercury thermometer (Figure 1) was used to obtain the data. This type thermometer, equipped with a floating steel tattletale device, allows maximum and minimum temperatures to be recorded. The tattletale device rests on the menisci of the mercury and moves only in the upward direction. When a meniscus moves in the downward direction it leaves the tattletale at the departure point, thus indicating the maximum or minimum temperature for the measurement period. Using a magnet, the tattletales are reset to rest on the menisci after recording the maximum and minimum temperatures. These thermometers are generally mounted on the bulkhead of the ship or laid on top of the ordnance within the locker.

The thermometer manufacturers (Taylor, Weksler and Moeller) warrant that the temperature readings are accurate to within 2°F at the time of delivery.

DATA HANDLING

The raw data were received from the aircraft carriers in various forms, i.e., temperature logbooks, individual monthly magazine temperature record cards or individual temperature record sheets gathered together in an envelope. These records identified the month, day and year the temperatures were recorded as well as the magazine or compartment of data origin.

These raw data were keypunched, reduced, tabulated and plotted to yield meaningful statistics and significant points of interest for upper and lower deck levels of each aircraft carrier and groups of aircraft carriers. Upper deck level was defined as the second deck and above; the lower deck level was the third deck and below. This division of levels took into account the temperature data from above and below the waterline and their possible effects.

Appendix A details the processing of the raw data.

RESULTS AND CONCLUSIONS

In excess of 1.1 million data points were collected during this investigation. These data represent a composite of the 12 years from 1960 through 1972. The types of carriers providing these data can be divided into four classes according to hull design and characteristics: (1) Essex, (2) Midway, (3) Forrestal and (4) Enterprise. The following discussions of the specific carrier classes and the carrier fleet in general bear out that the thermal environment aboard such craft is truly moderate.

Though the data presented herein make it highly obvious, it must be stated that the *old design values of -65 and 160°F never were experienced.* Temperatures of these magnitudes simply are not in evidence on board an aircraft carrier. This fact was previously recognized in Part 1 of this report series as related to cruisers and guided missile frigates.

MIDWAY CLASS

Since the most contiguous data were received from the U.S.S. *Coral Sea* (CVA-43), these data are presented first (Figures 2 through 5). It is believed that the following data will reinforce, in a more general format, the results from this single ship.

Figure 2 is the cumulative probability display for all the magazine temperature records from the U.S.S. *Coral Sea*. Notice that the maximum and minimum temperatures displayed are about 105 and 42°F, respectively. In essence, the temperature spread is about the same as that of free sea water. Even solar radiation loads of the tropical South Pacific and South China Sea do not seem to change this pattern of moderation. The *far left cumulative probability curve in Figure 2 is that for all the low temperatures recorded;* the right-hand line is for the daily high

temperatures. The center line is the most probable fit between the two lines. This is an attempt to provide a single line as it should look if all 24 hourly temperatures for each day were at hand instead of only the single hottest and coldest hour each day. (Note: Figures not specific to the U.S.S. *Coral Sea* data present only the center curve.) Since the moderate mid-range data are not available, the two curves (maximum and minimum cumulative probabilities) would tend to be extreme. In the overall terms of ordnance design, however, even this "extreme" data are rather benign compared to other events in the stock-pile-to-target sequence.

Figure 3 is the cumulative probability of occurrence curve for the ammunition magazines located below the main deck. The major ordnance items (and other materiel) are, in fact, stored below the main deck. Usually only pyrotechnics are stored above the main deck.

The above deck magazettes and pyrotechnic lockers display is shown in Figure 4. Keep in mind that during the Vietnam emergency the ordnance use and replenishment rates were such that iron bombs were not taken down to the magazines in the bottom of the aircraft carriers. Rather, these items were stored on the main deck for rapid access. Figure 5 could represent this type bomb storage situation, though in point of fact the bombs were not placed in these lockers. These lockers are, however, somewhat representative of the temperatures that existed in the areas where the bombs were consigned for short durations on Yankee Station.

ENTERPRISE CLASS

The U.S.S. *Enterprise* (CVAN-65) is a nuclear powered modern generation aircraft carrier. Figures 6 through 14 are the cumulative data for each deck or level on which ordnance is stored. (Keep in mind that the deck numbering system for aircraft carriers is such that a number by itself is indicative of the main deck (1) and below (2, 3, 4, etc.).

A number preceded by a zero is indicative of a deck location above the main deck (01, 02, 03, etc.). The highest zero numbered location is the top of the ship; the largest numbered deck is the bottom of the ship.)

Figures 6 through 14 are arranged in sequence so that we start from the top of the ship, work down to the main deck, and on through to the bottom of the ship. Note that the temperature differences between the U.S.S. *Coral Sea* figures and the U.S.S. *Enterprise* are minor. In essence, one group tends to reinforce the other even though the size and structure of the two aircraft carriers are quite different.

ESSEX CLASS

Figures 15 and 16 represent the data from the U.S.S. *Essex* (CVS-9). This carrier was chosen because it is the named representative of the class and the oldest aircraft carrier from the class lot. Also, the bulk of the acquired data came from the CVS-9. Figures 15 and 16 display the reported data from the above deck's magazettes and lockers and the below waterline magazines, respectively. When compared with similar data from either the U.S.S. *Enterprise* or U.S.S. *Coral Sea*, these data fall right in line. Also, in the main, these data are truly moderate, even in the extreme.

FORRESTAL CLASS

The U.S.S. *Forrestal* (CVA-59) was arbitrarily chosen to represent its aircraft carrier class. Only 1 year's worth of data is integrated into the plots provided in Figures 17 and 18; however, a comparison of these figures with Figures 15 and 16 and those from the U.S.S. *Coral Sea* and U.S.S. *Enterprise* indicates that this newer class of ship seems to provide the same benign thermal environment for ordnance and materiel as the other three carrier types.

CARRIER FLEET

The following ships provided magazine temperature data:

Ship	Hull No.	Data years
U.S.S. *Essex*	CVS-9	1960-1964
U.S.S. *Yorktown*	CVS-10	1966
U.S.S. *Randolph*	CVS-15	1964-1967
U.S.S. *Ticonderoga*	CVS-14	1966-1969
U.S.S. *Wasp*	CVS-18	1966
U.S.S. *Bon Homme Richard*	CVA-31	1965-1967
U.S.S. *Oriskany*	CVS-34	1967-1968
U.S.S. *Shangri-La*	CVA-38	1966-1968
U.S.S. *Franklin D. Roosevelt*	CVA-42	1969
U.S.S. *Coral Sea*	CVA-43	1960-1970
U.S.S. *Forrestal*	CVA-59	1968
U.S.S. *Saratoga*	CVA-60	1965-1966
U.S.S. *Independence*	CVA-62	1970-1972
U.S.S. *Kitty Hawk*	CVA-63	1969
U.S.S. *Constellation*	CVA-64	1969-1970
U.S.S. *Enterprise*	CVAN-65	1962-1971
U.S.S. *America*	CVA-66	1965-1967

Figures 19 through 35 indicate the differences in structure and size of these representative U.S. Navy aircraft carriers, both past and present.

An attempt was made to consolidate all the data from all the ships. Since the U.S.S. *Coral Sea* and U.S.S. *Enterprise* data were so similar, it was thought that the data from all the ships might conveniently group

to provide a truly universal display of magazine temperature data for any given level in any carrier operating in any of the U.S. Navy fleets. Note that at no time during the 12 calendar years of this data accumulation effort was any aircraft carrier tasked to sail to a given area specifically for this project. Rather, it can be assumed that sailing orders for any carrier were typical of that particular fleet's mission during that period. Therefore, it seems logical that a random use population of mission induced magazine temperature information was indeed derived.

Figure 36 provides a total accumulation of all ships composite data. This figure can be used, for all intents and purposes, as the thermal criteria for storage of ordnance munitions and materiel on board aircraft carriers. In fact, since the 03, 02 and 01 levels data are also incorporated in this figure, it can be used for the thermal criteria for all operations on board an aircraft carrier. Keep in mind, however, that this figure is only responsive to thermally quiescent circumstances. Any internally generated heat, such as in avionics or electrical equipment must be added to the value selected from Figure 36.

In Figure 36 the curve shape is very symmetrical. The symmetry is very similar to that of a Gaussian distribution. Because a Gaussian display more easily portrays the "extreme" or end point data, while fully portraying the central portion of the data population, an attempt was made to place Figure 36 in Gaussian format. Figure 37 is a replot of the Figure 36 data on Gaussian paper. The prime use of Figure 37 is that some reader may want to derive a quantification for even more "extreme" data than was measured during this project. Because there is no end point to a Gaussian distribution, the straight line of Figure 37 can be extended out to infinity if desired. By the statistical laws governing the Gaussian distribution, the probability of occurrence for any chosen temperature can be derived from the extension of the plot of Figure 37. However, moderation in all things should be the watchword. Remember that the area under a Gaussian curve between 3σ is 99.7% of the total population.

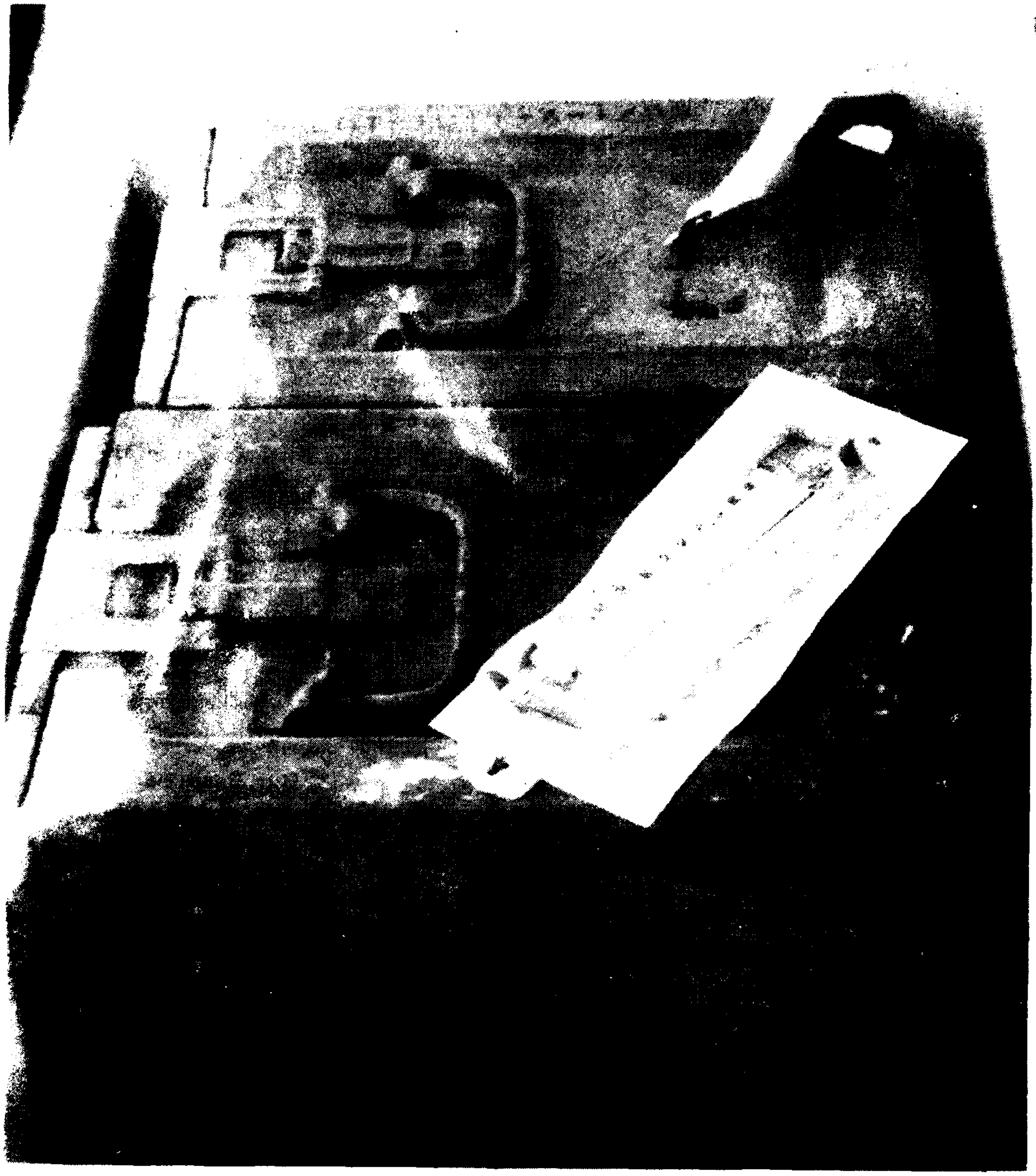

FIGURE 1. Horseshoe Type Thermometer.

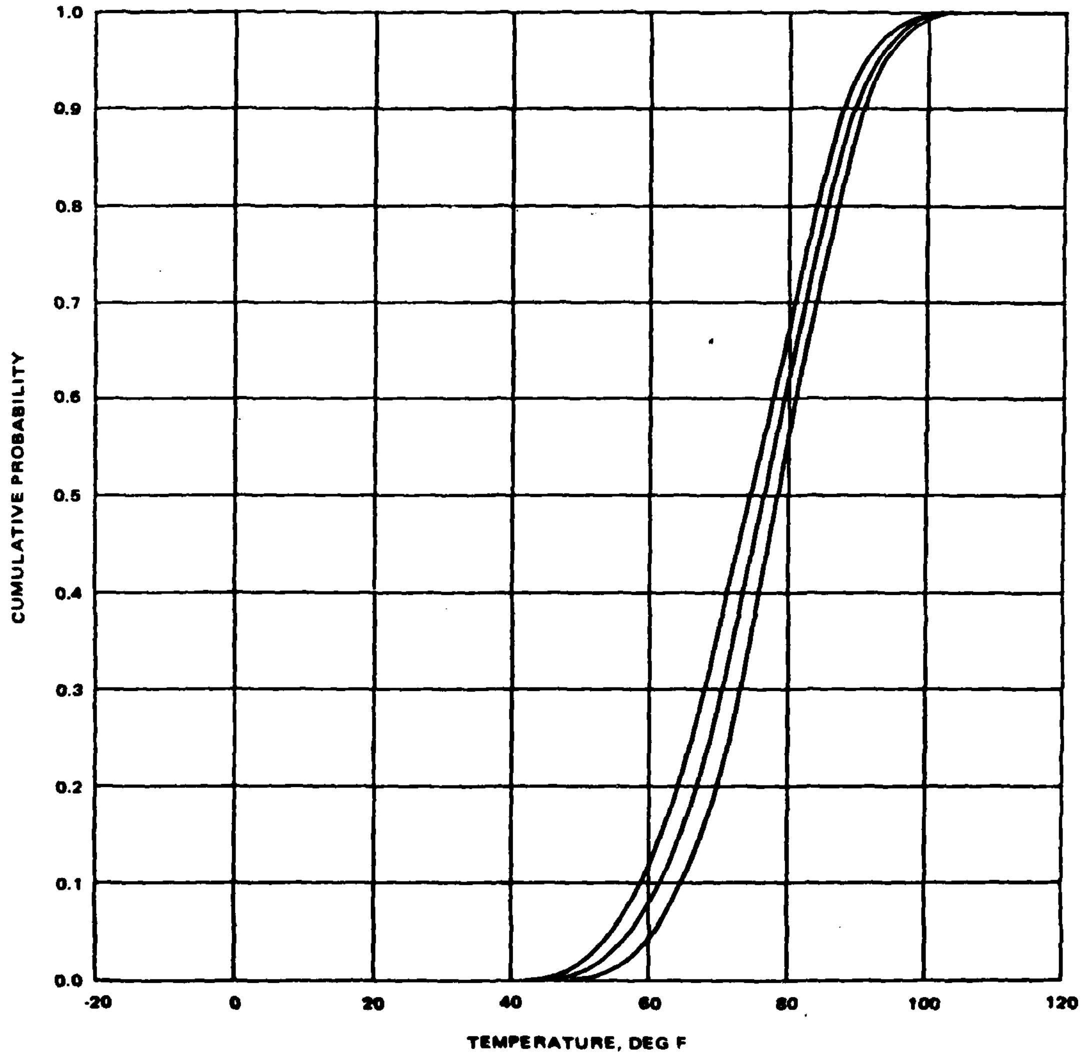

FIGURE 2. U.S.S. *Coral Sea* (CVA-43), All Levels.

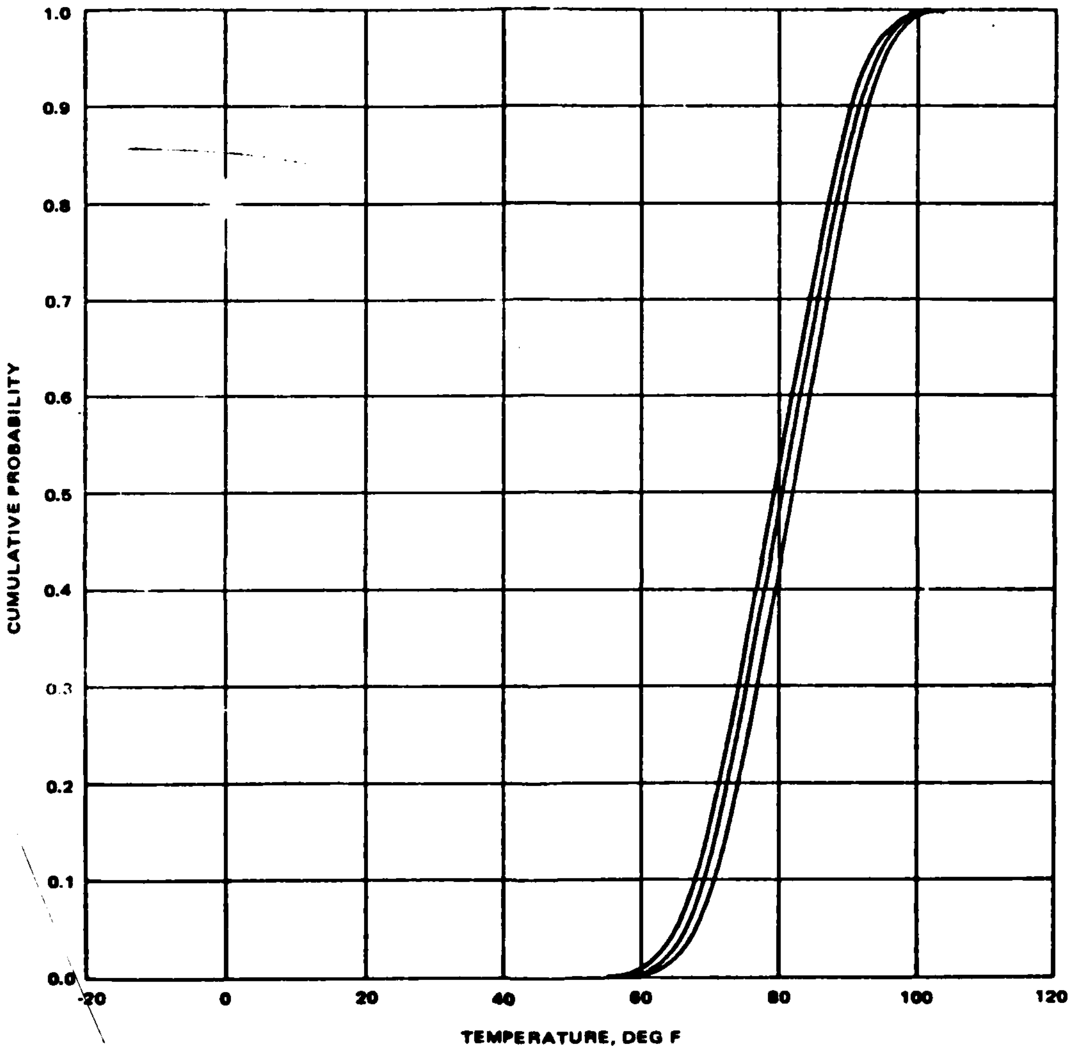

FIGURE 3. U.S.S. *Coral Sea* (CVA-43), All Levels Below Waterline.

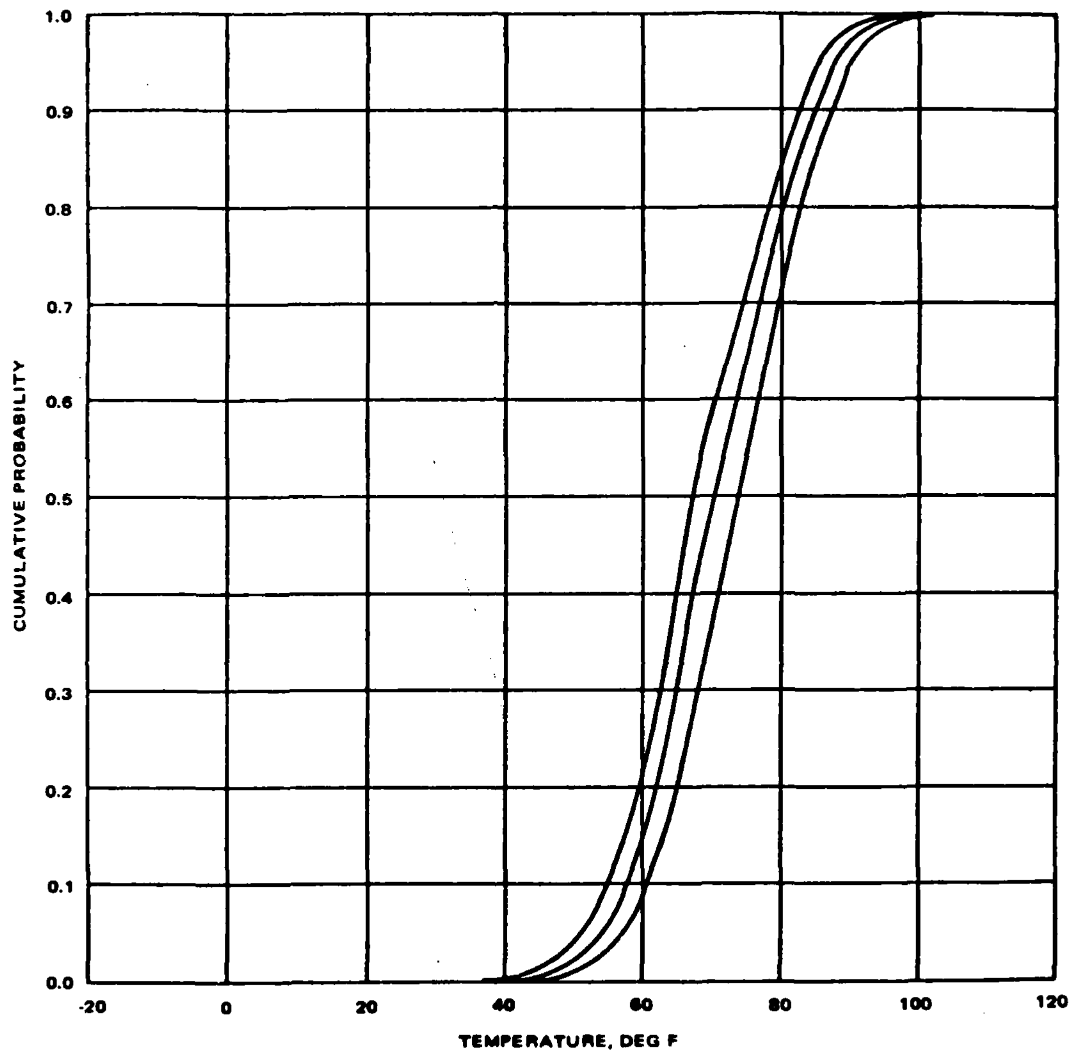

FIGURE 4. U.S.S. *Coral Sea* (CVA-43), All Levels Above Waterline.

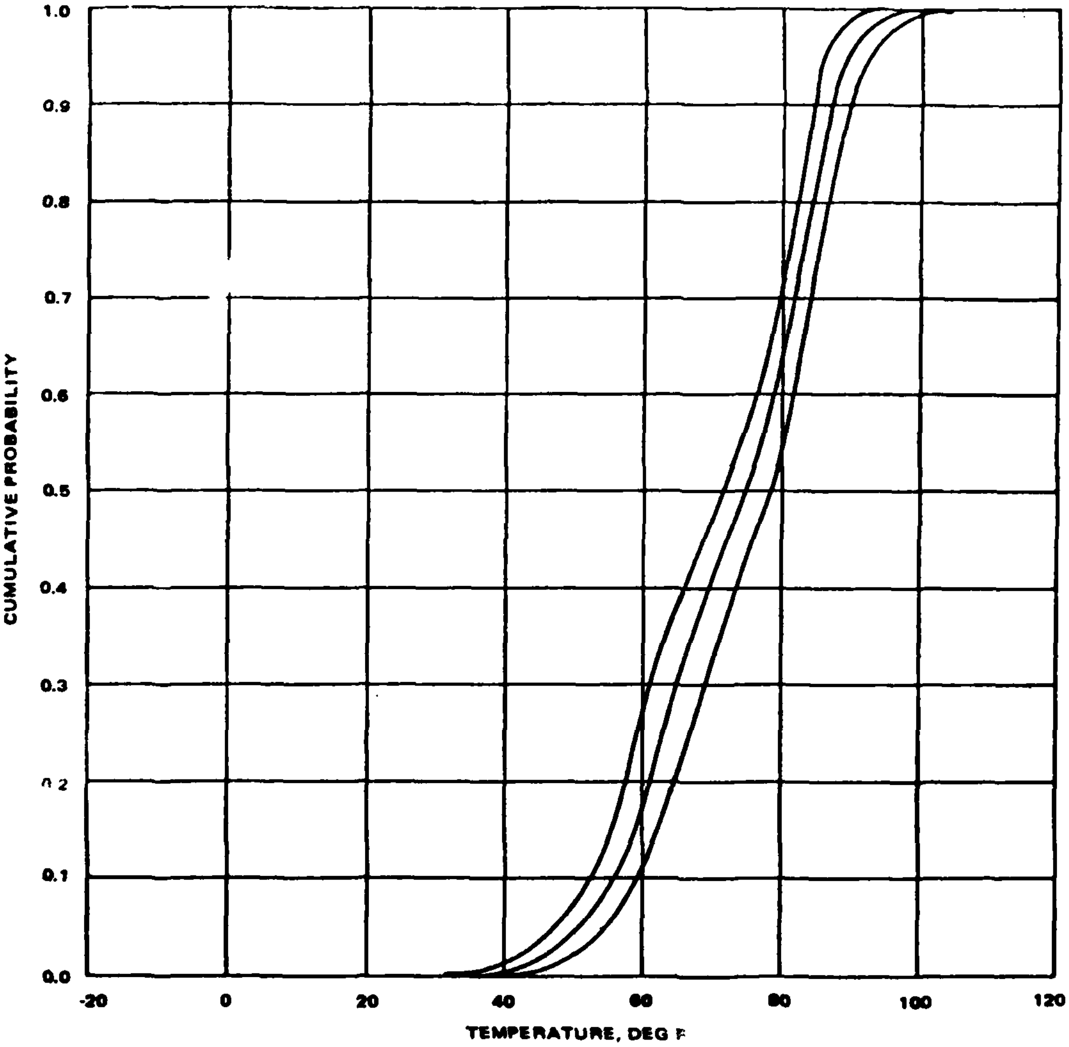

FIGURE 5. U.S.S. *Coral Sea* (CVA-43), Fantail Lockers.

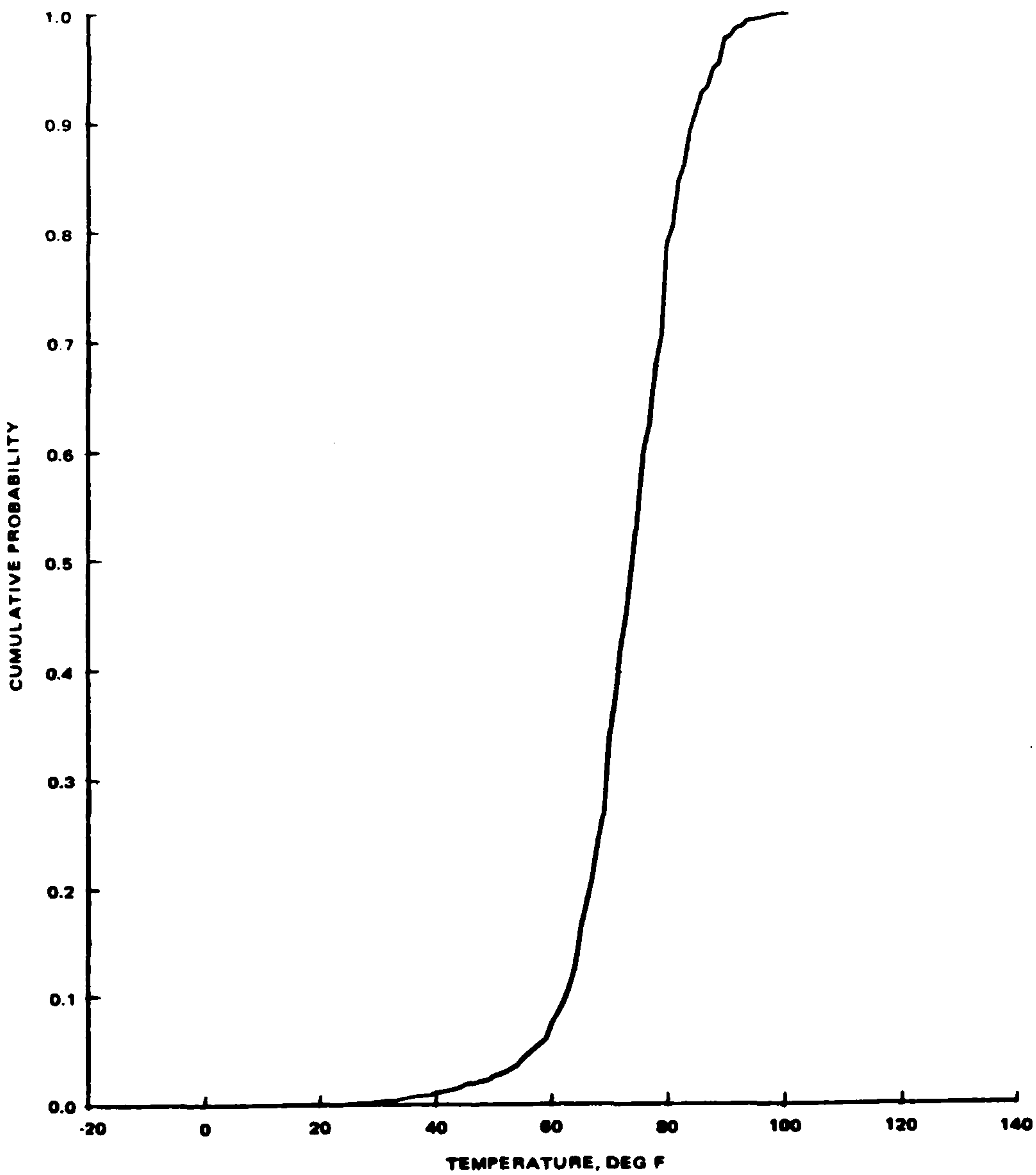

FIGURE 6. U.S.S. *Enterprise* (CVAN-65), 03 Level.

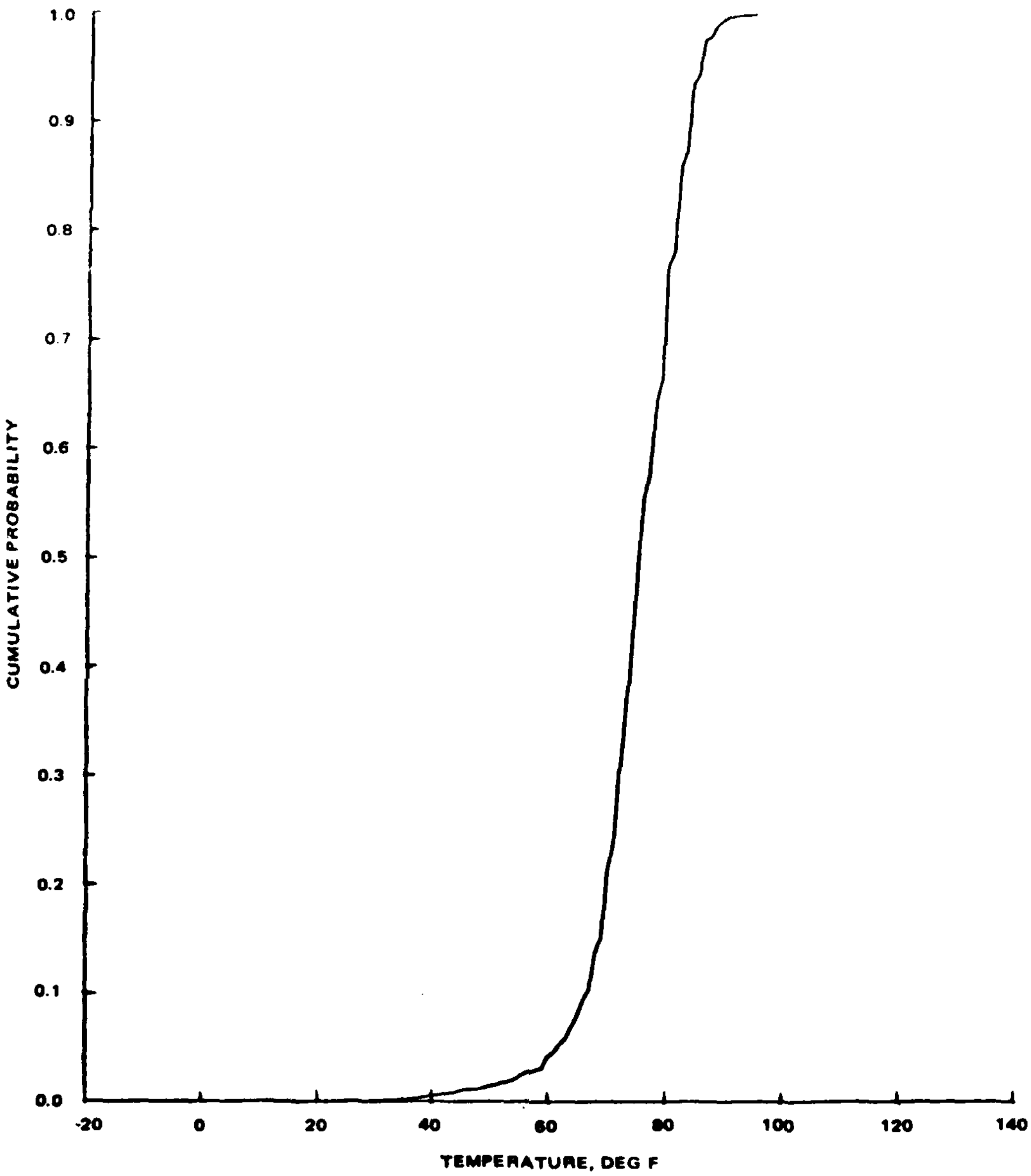

FIGURE 7. U.S.S. *Enterprise* (CVAN-65), 02 Level.

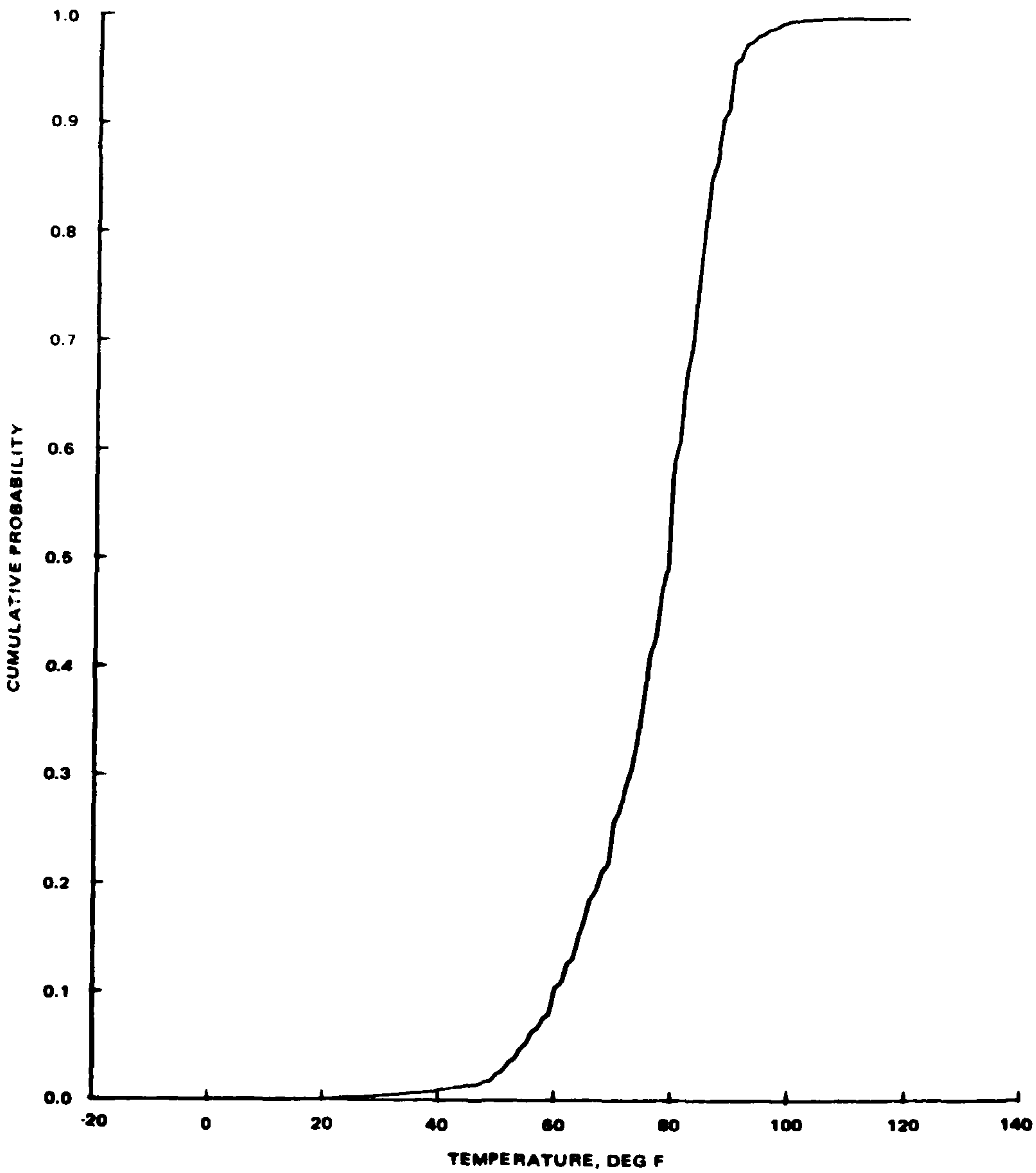

FIGURE 8. U.S.S. *Enterprise* (CVAN-65), 01 Level.

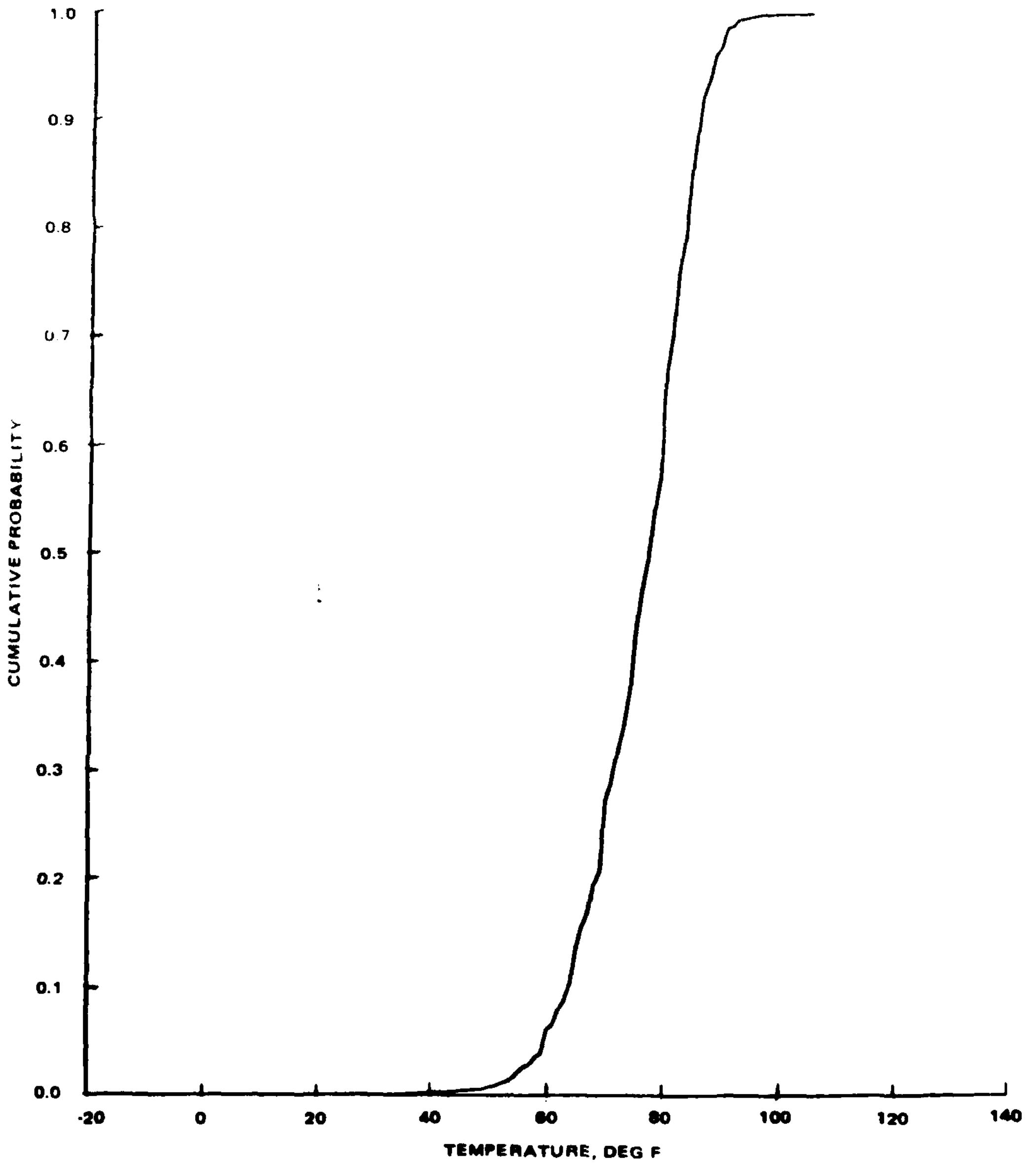

FIGURE 9. U.S.S. *Enterprise* (CVAN-65), 1 Level.

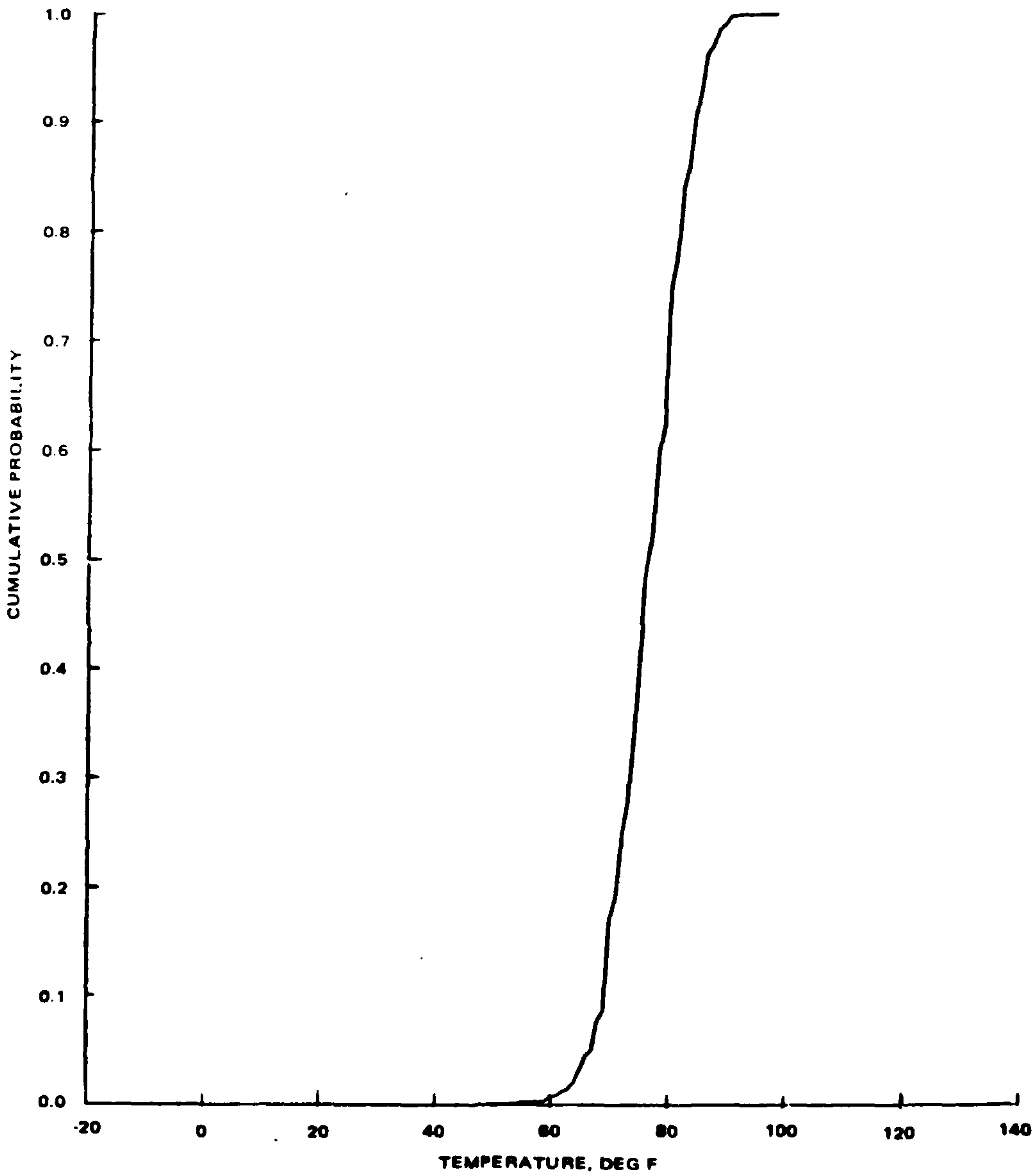

FIGURE 10. U.S.S. *Enterprise* (CVAN-65), 2 Level.

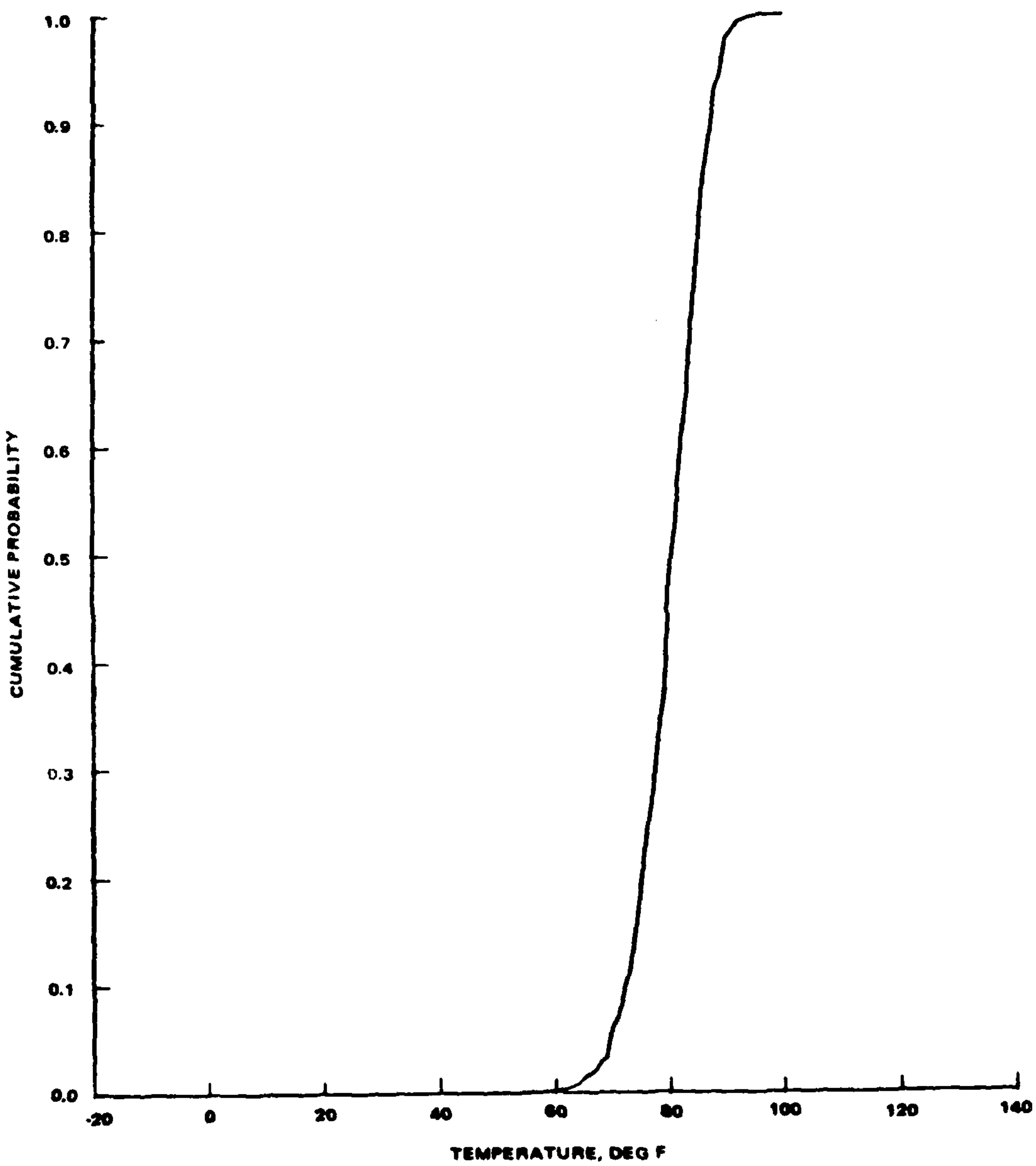

FIGURE 11. U.S.S. *Enterprise* (CVAN-65), 4 Level.

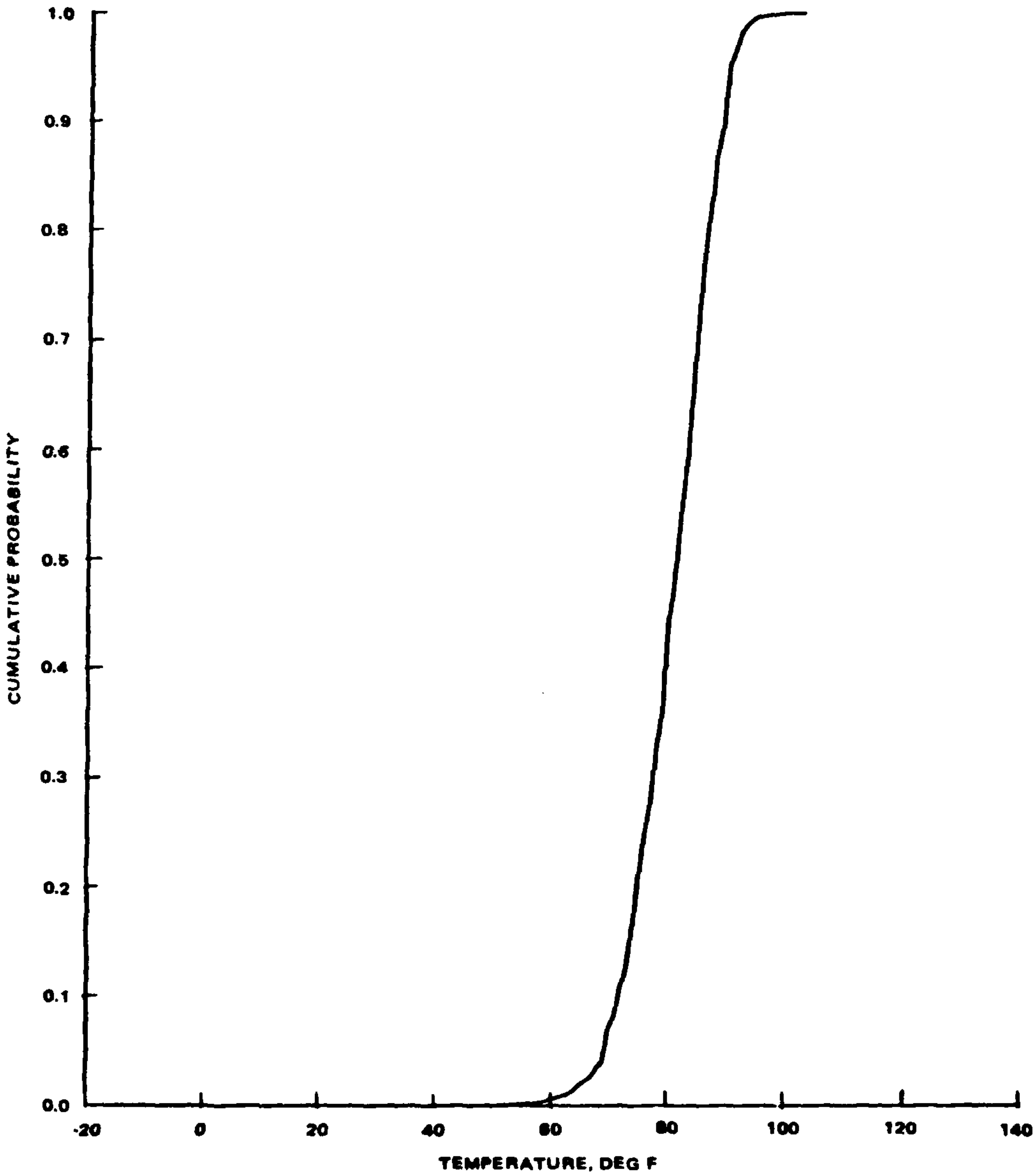

FIGURE 12. U.S.S. *Enterprise* (CVAN-65), 5 Level.

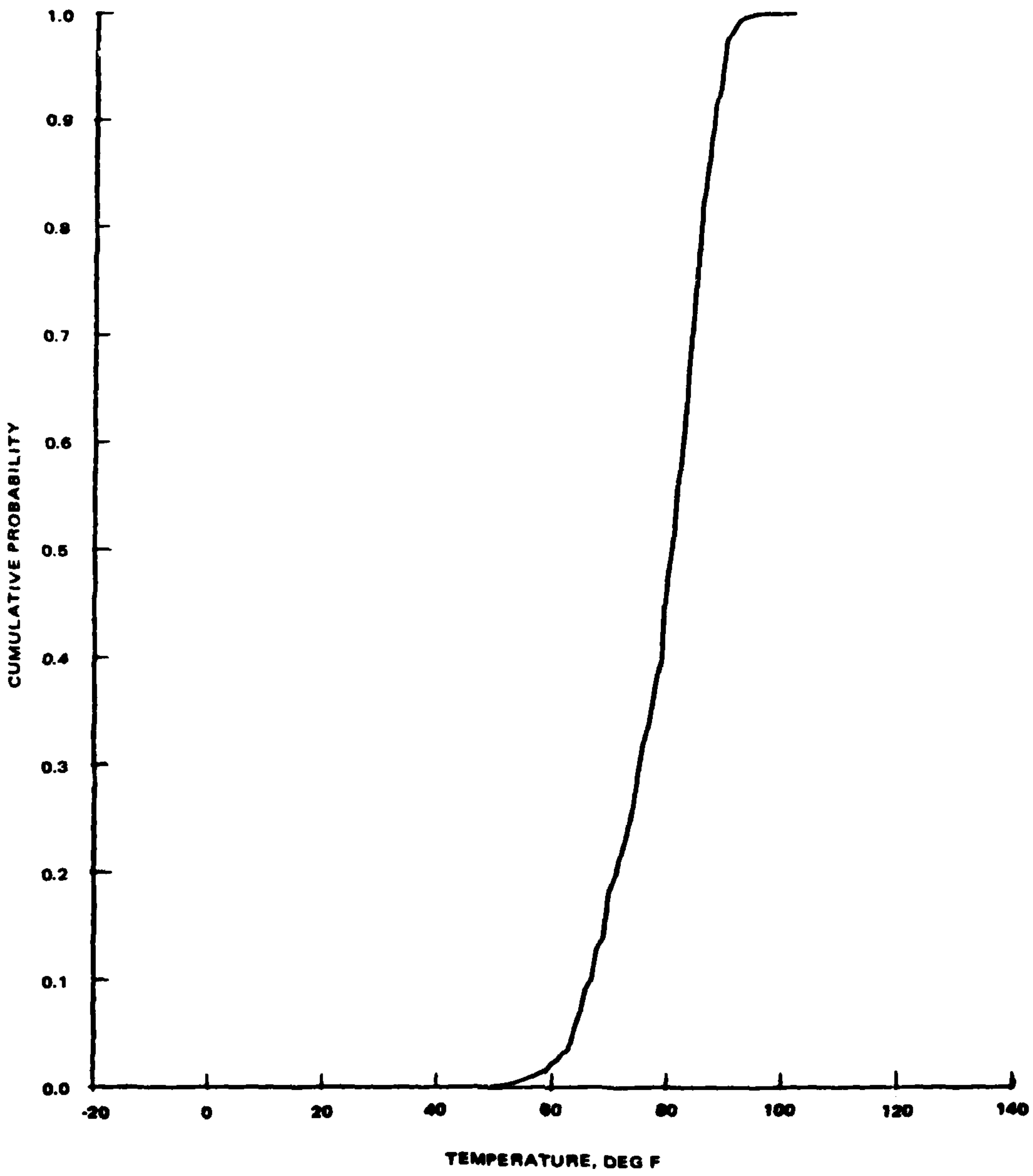

FIGURE 13. U.S.S. *Enterprise* (CVAN-65), 6 Level.

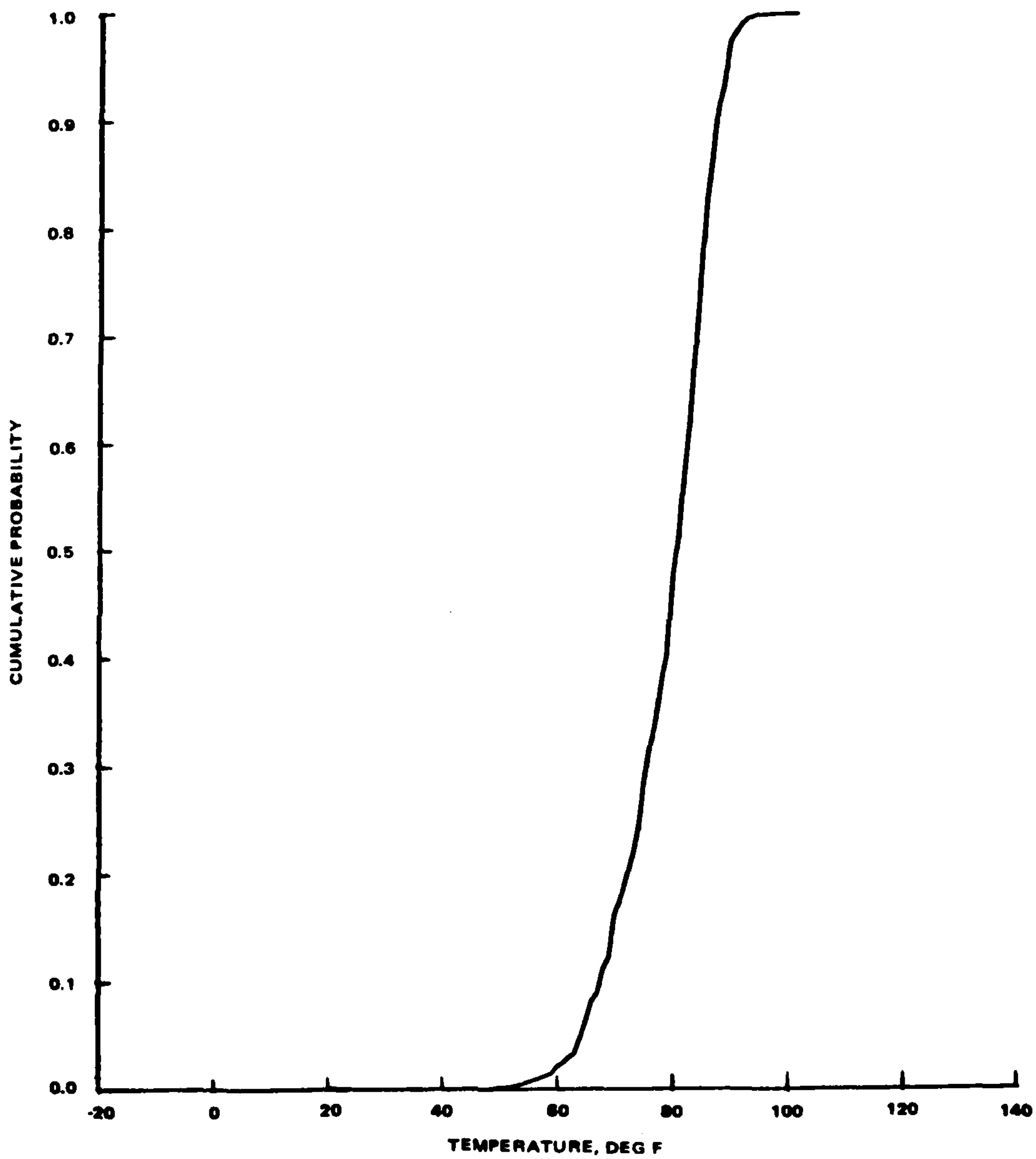

FIGURE 14. U.S.S. *Enterprise* (CVAN-65), 7 Level.

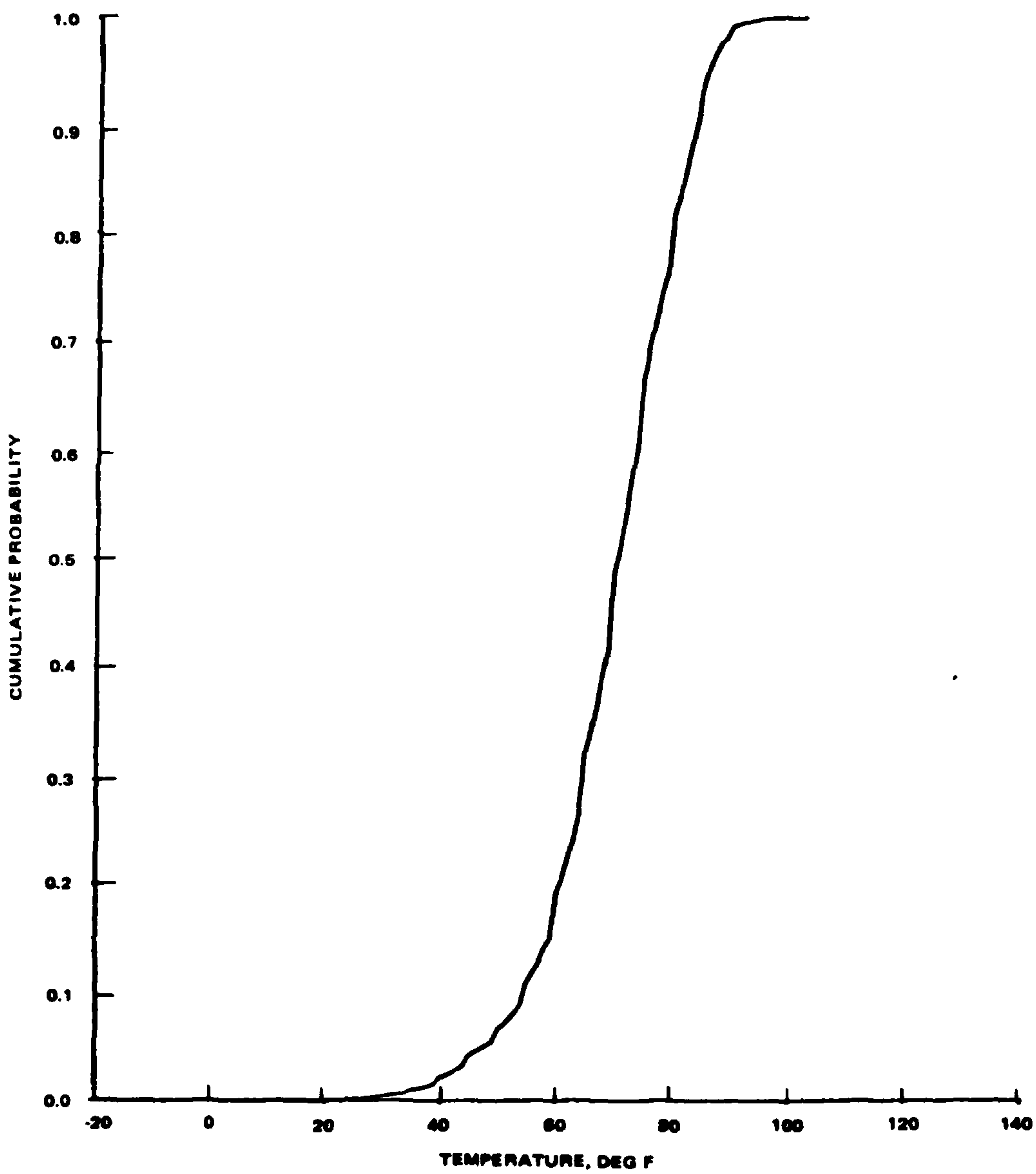

FIGURE 15. U.S.S. *Essex* (CVS-9), Upper Levels - Consolidated.

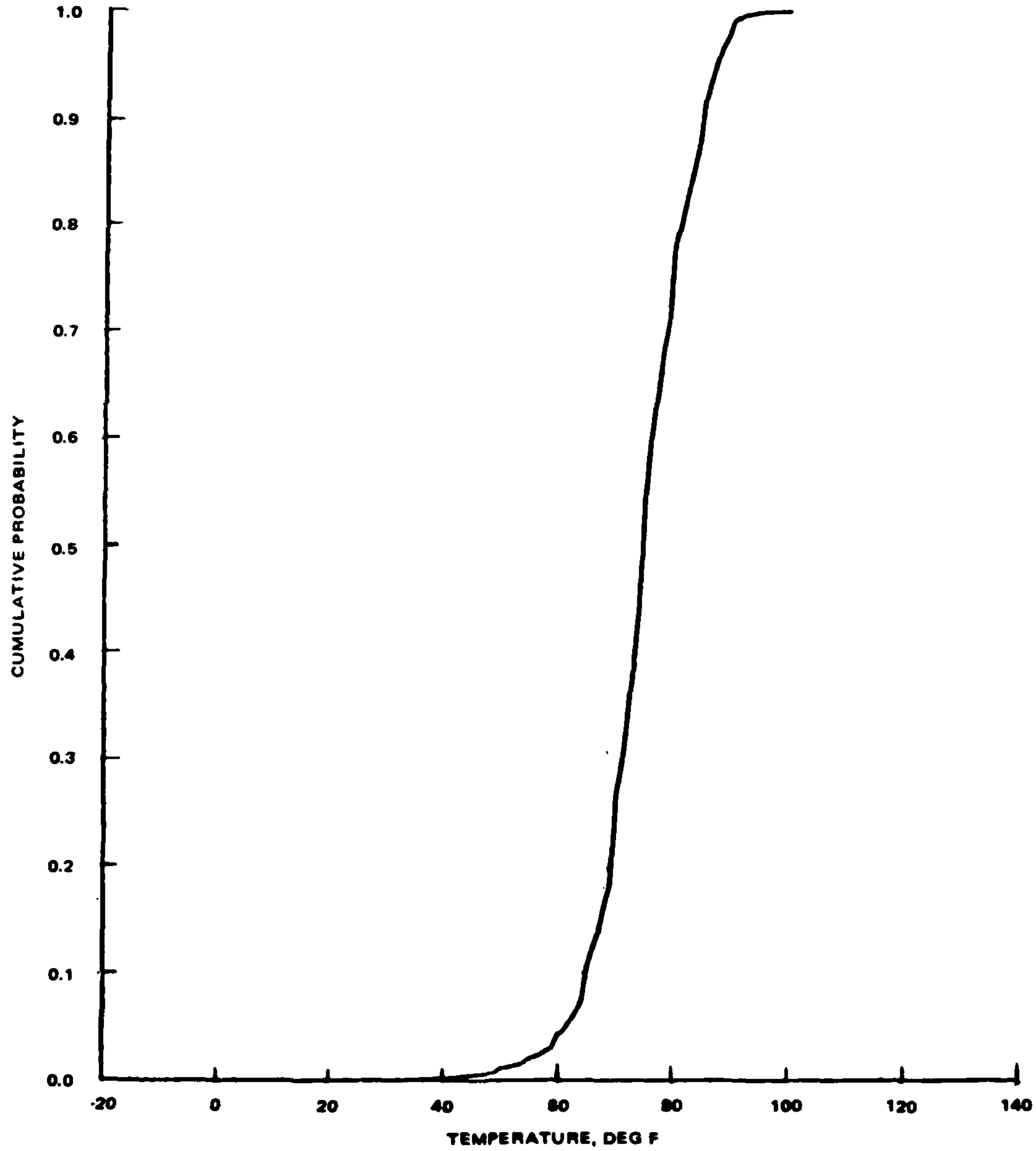

FIGURE 16. U.S.S. *Essex* (CVS-9), Lower Levels - Consolidated.

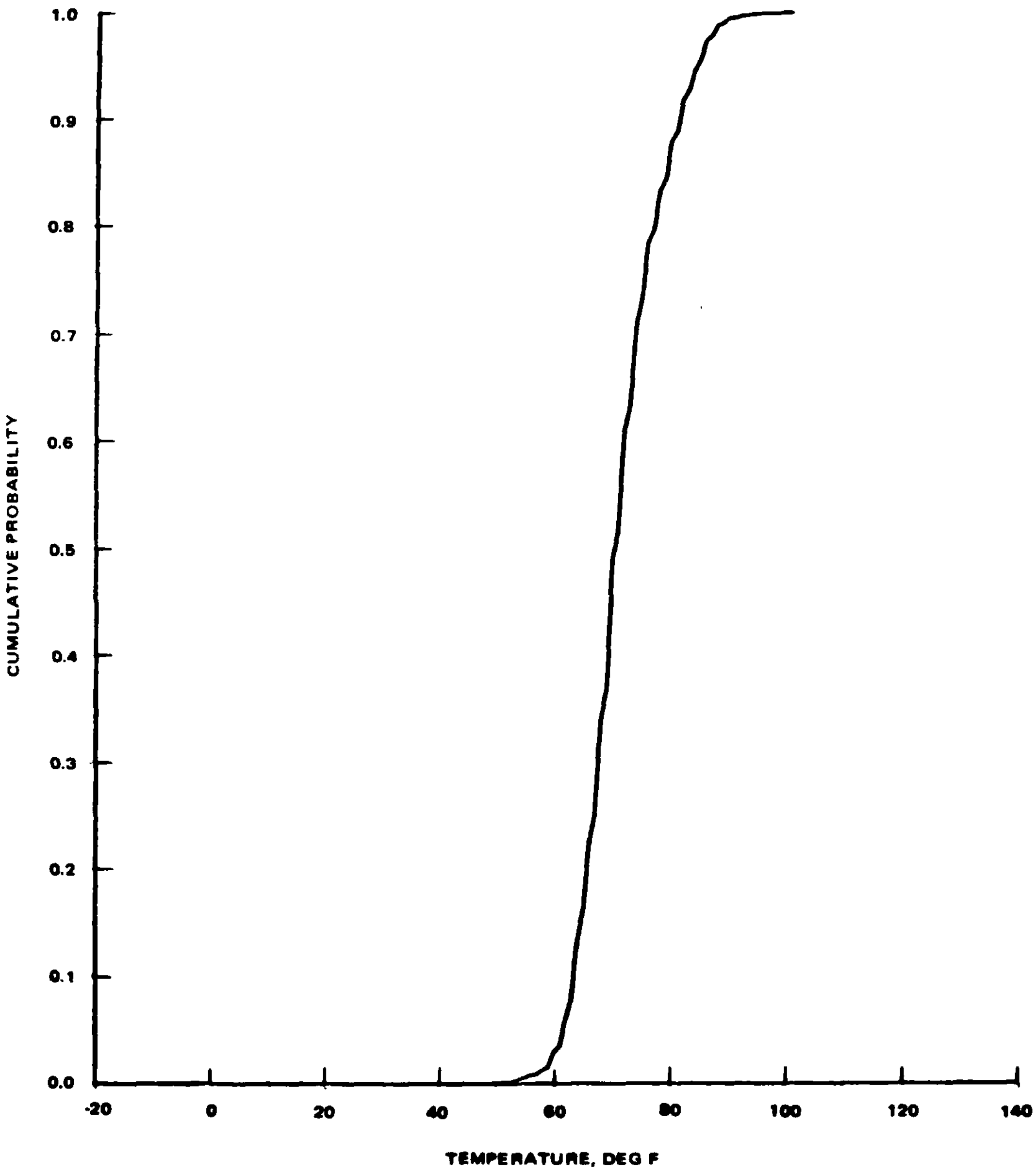

FIGURE 17. U.S.S. *Forrestal* (CVA-59), Lower Levels - Consolidated.

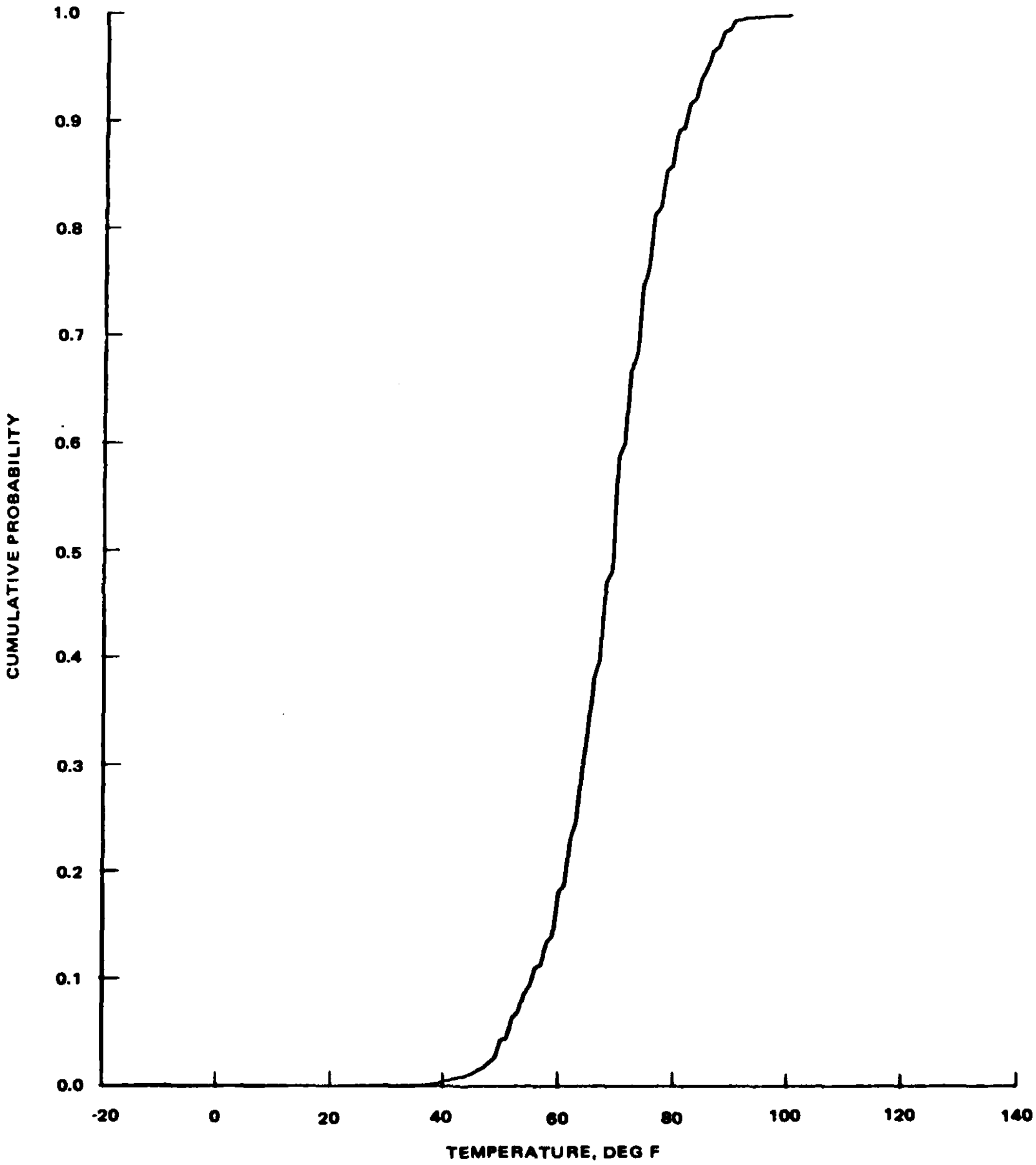

FIGURE 18. U.S.S. *Forrestal* (CVA-59), Upper Levels - Consolidated.

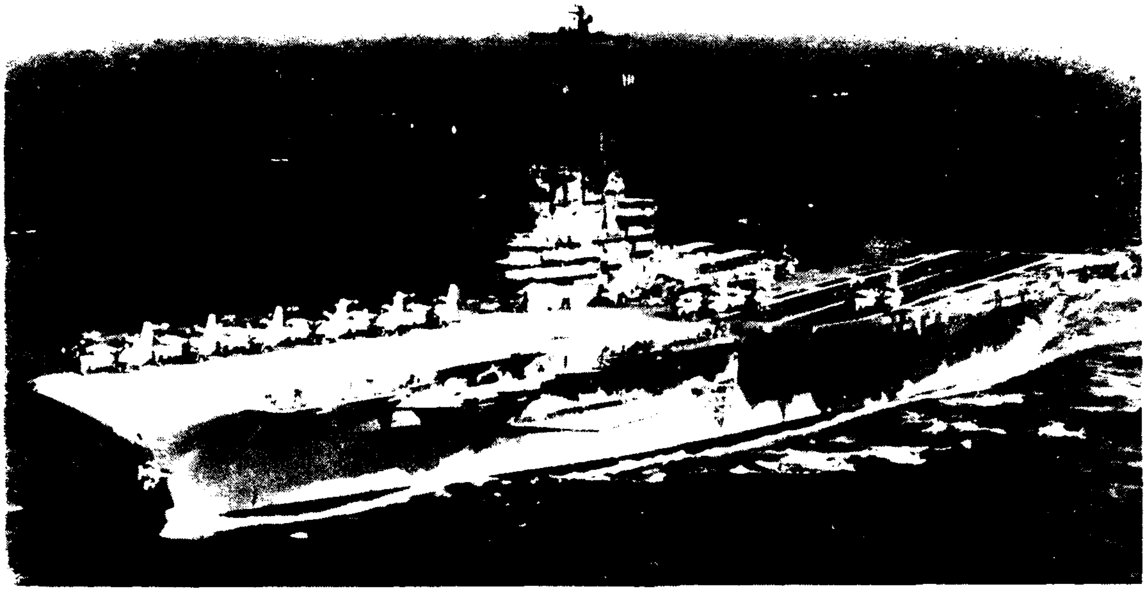

FIGURE 19. U.S.S. *Essex* (CVS-9).

FIGURE 20. U.S.S. *Yorktown* (CVS-10).

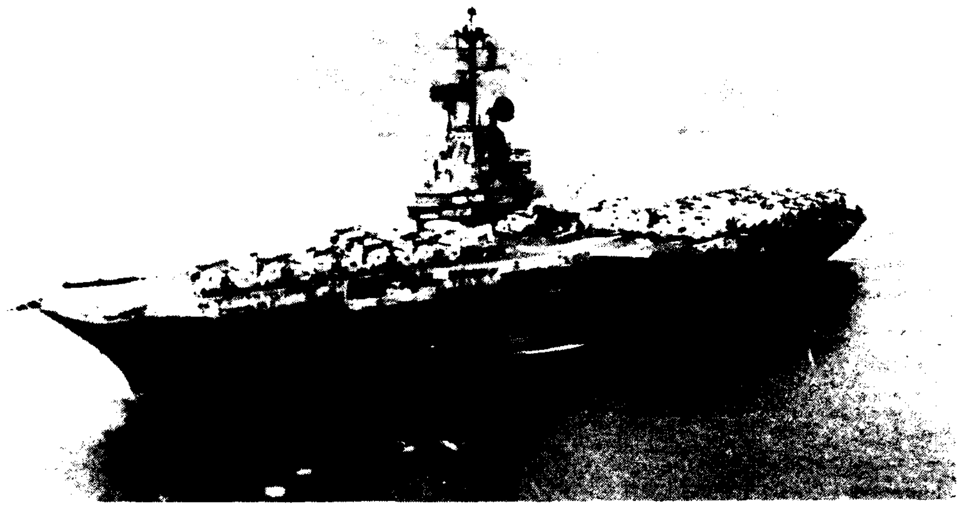

FIGURE 21. U.S.S. *Randolph* (CVS-15).

FIGURE 22. U.S.S. *Ticonderoga* (CVS-14).

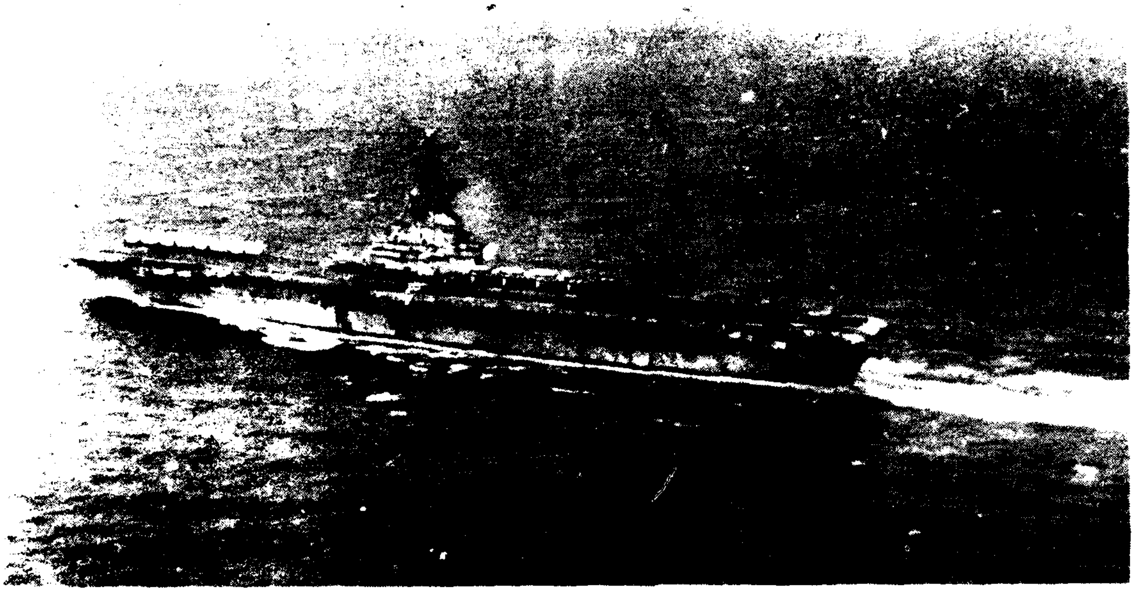

FIGURE 23. U.S.S. *Wasp* (CVS-18).

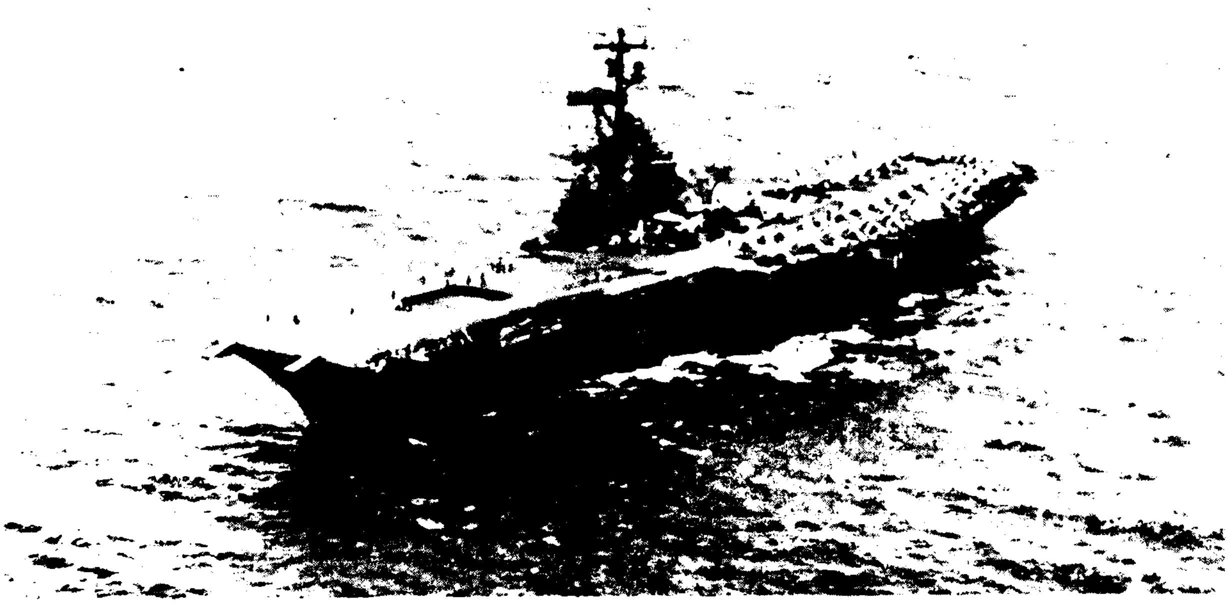

FIGURE 24. U.S.S. *Bon Homme Richard* (CVA-31).

FIGURE 25. U.S.S. *Oriskany* (CVS-43).

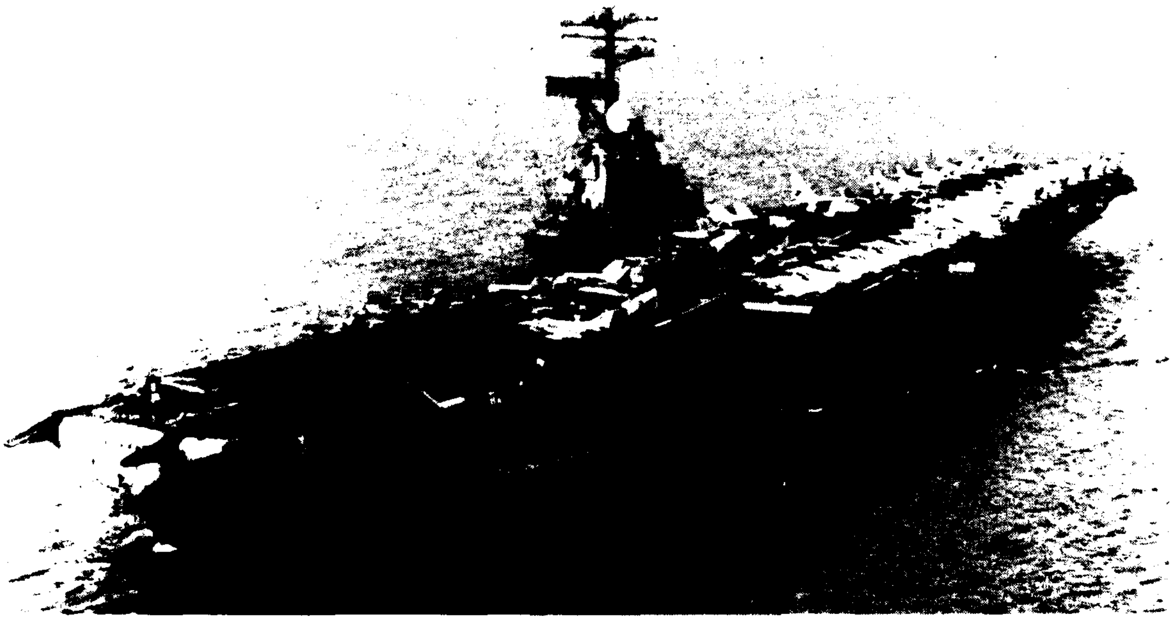

FIGURE 26. U.S.S. *Shangri-La* (CVA-38).

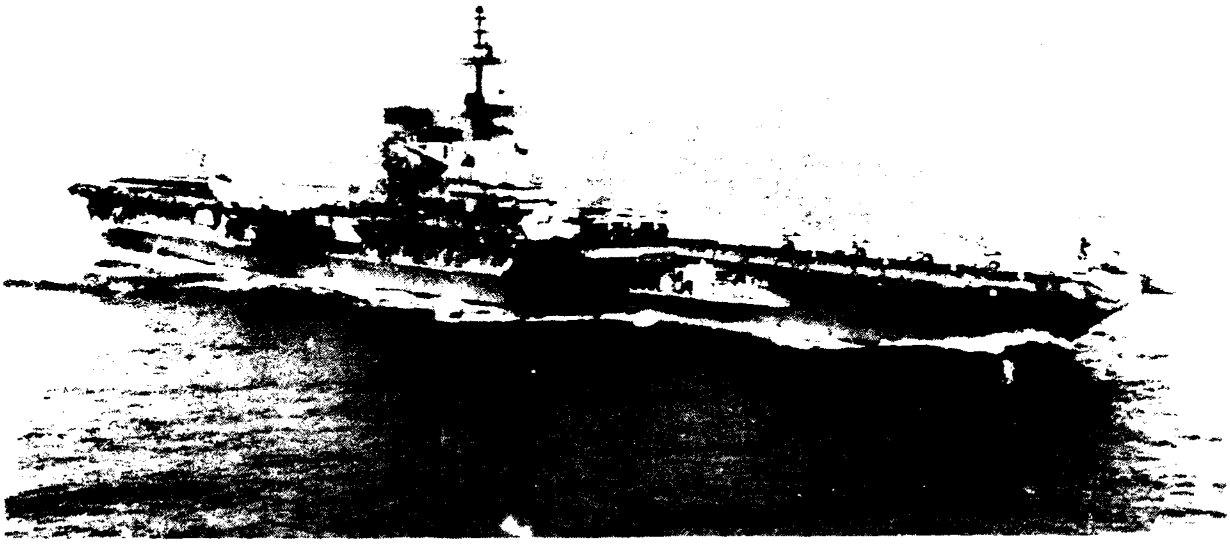

FIGURE 27. U.S.S. *Franklin D. Roosevelt* (CVA-42).

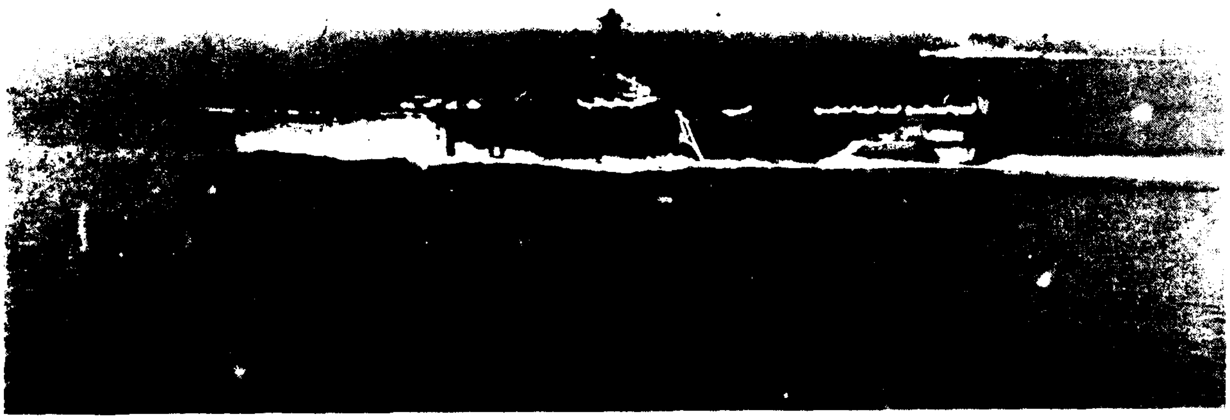

FIGURE 28. U.S.S. *Coral Sea* (CVA-43).

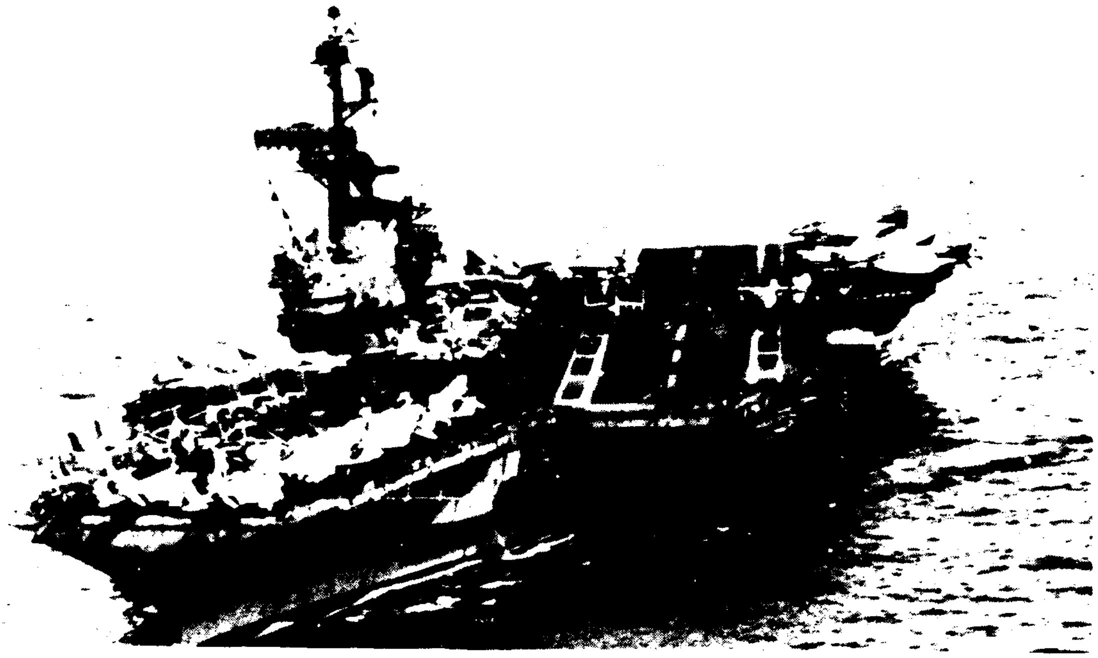

FIGURE 29. U.S.S. *Forrestal* (CVA-59).

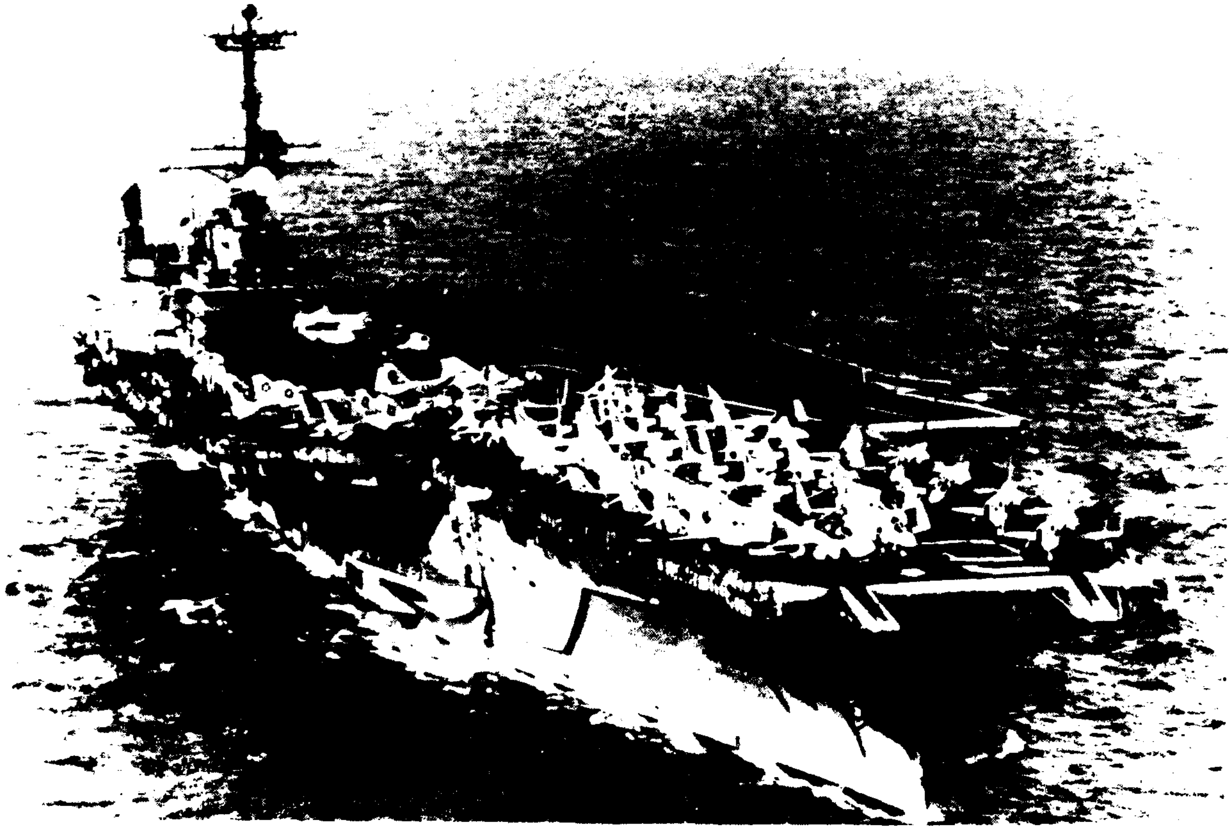

FIGURE 30. U.S.S. *Saratoga* (CVA-60).

FIGURE 31. U.S.S. *Independence* (CVA-62).

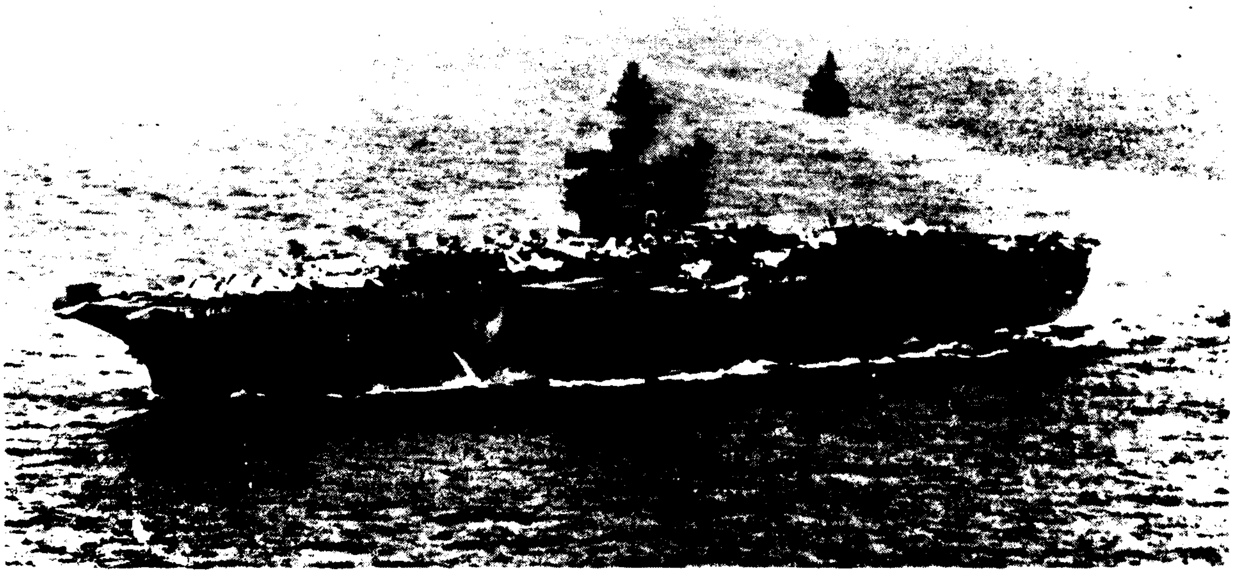

FIGURE 32. U.S.S. *Kitty Hawk* (CVA-63).

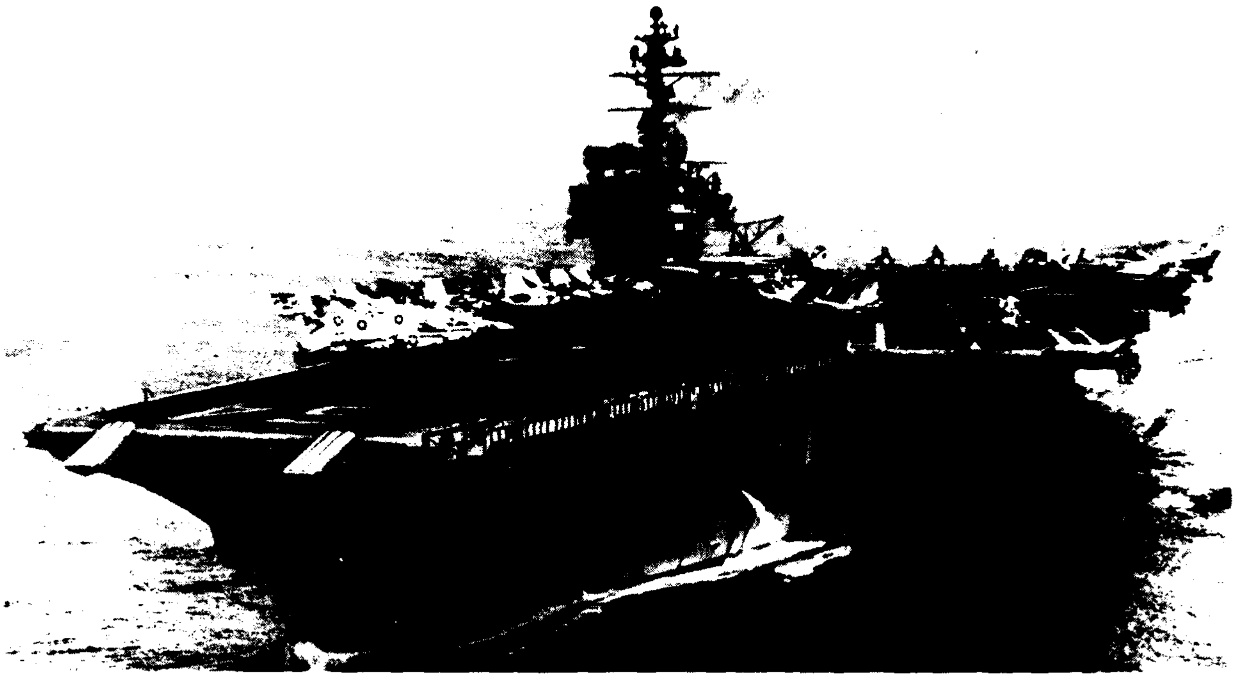

FIGURE 33. U.S.S. *Constellation* (CVA-64).

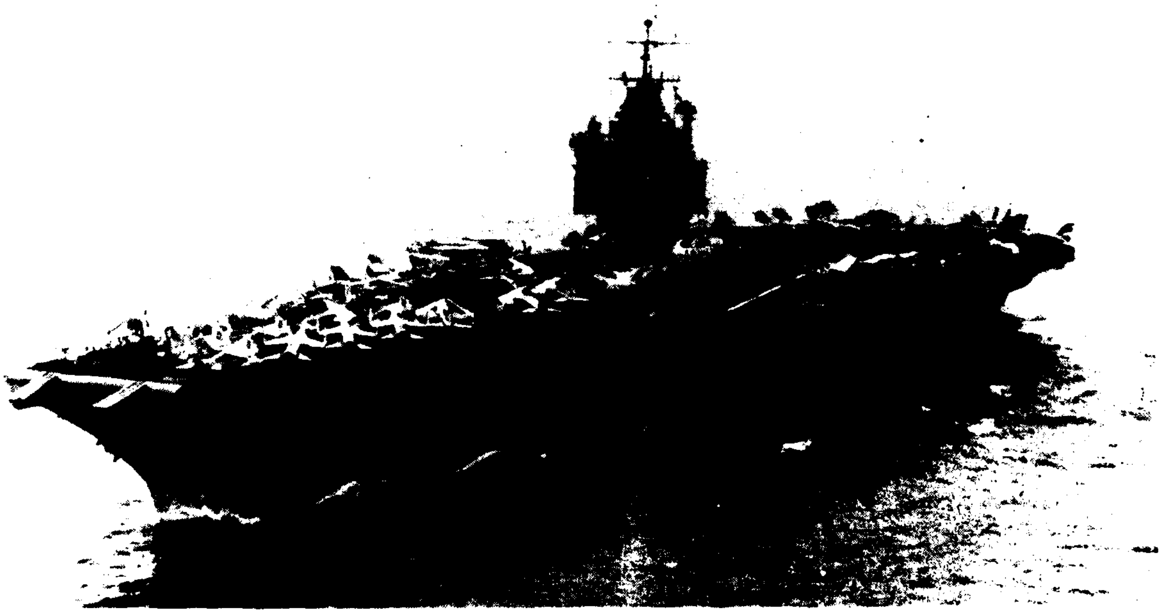

FIGURE 34. U.S.S. *Enterprise* (CVAN-65).

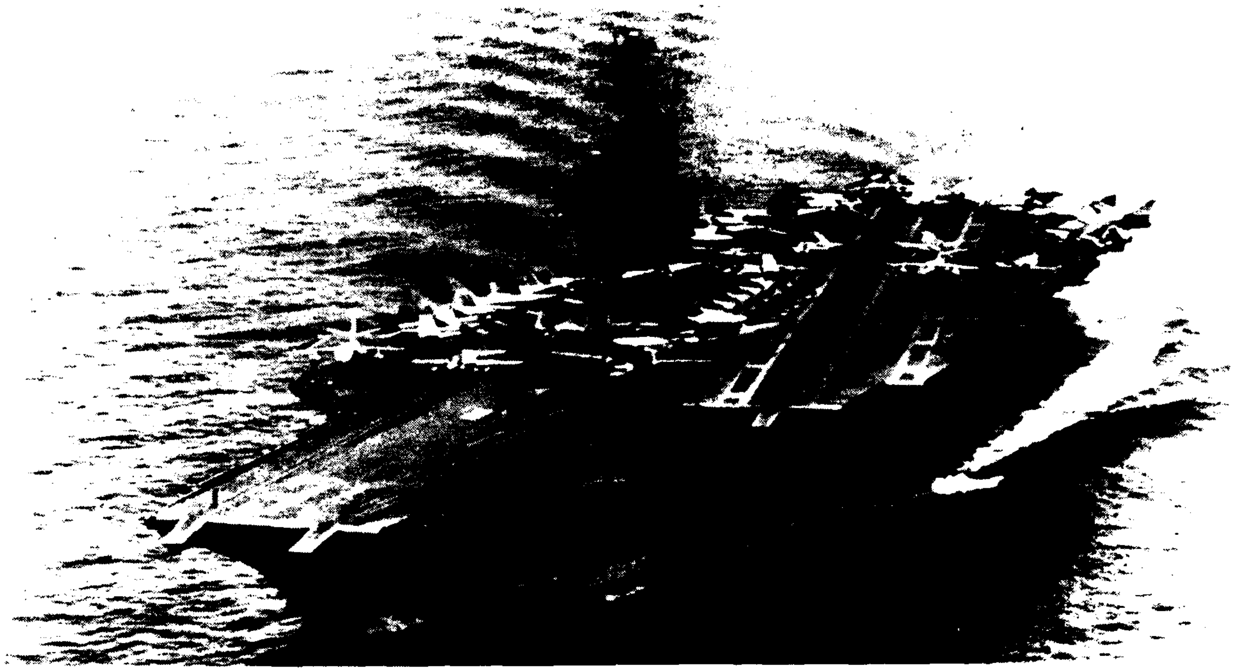

FIGURE 35. U.S.S. *America* (CVA-66).

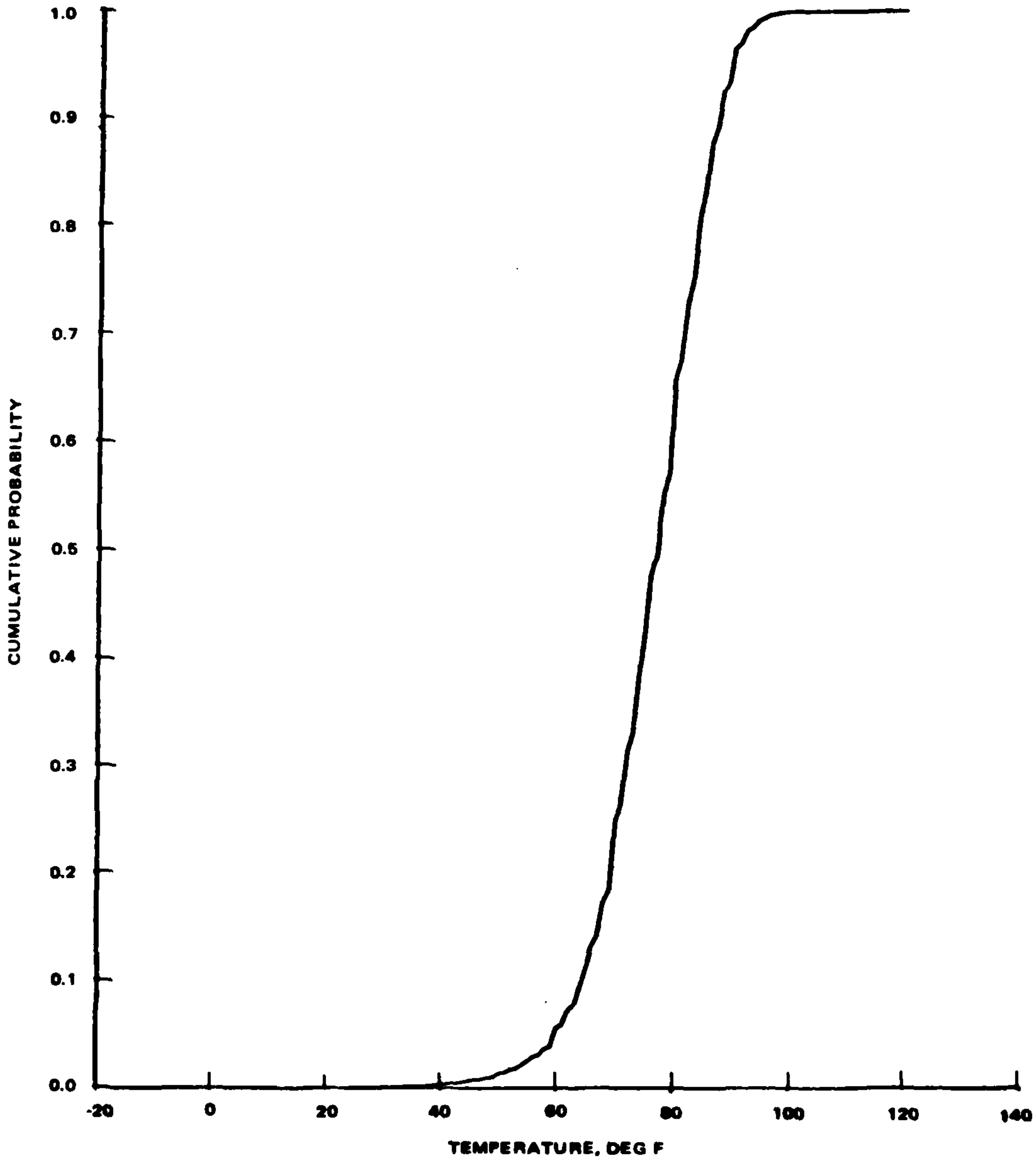

FIGURE 36. Composite of All Ships, All Levels.

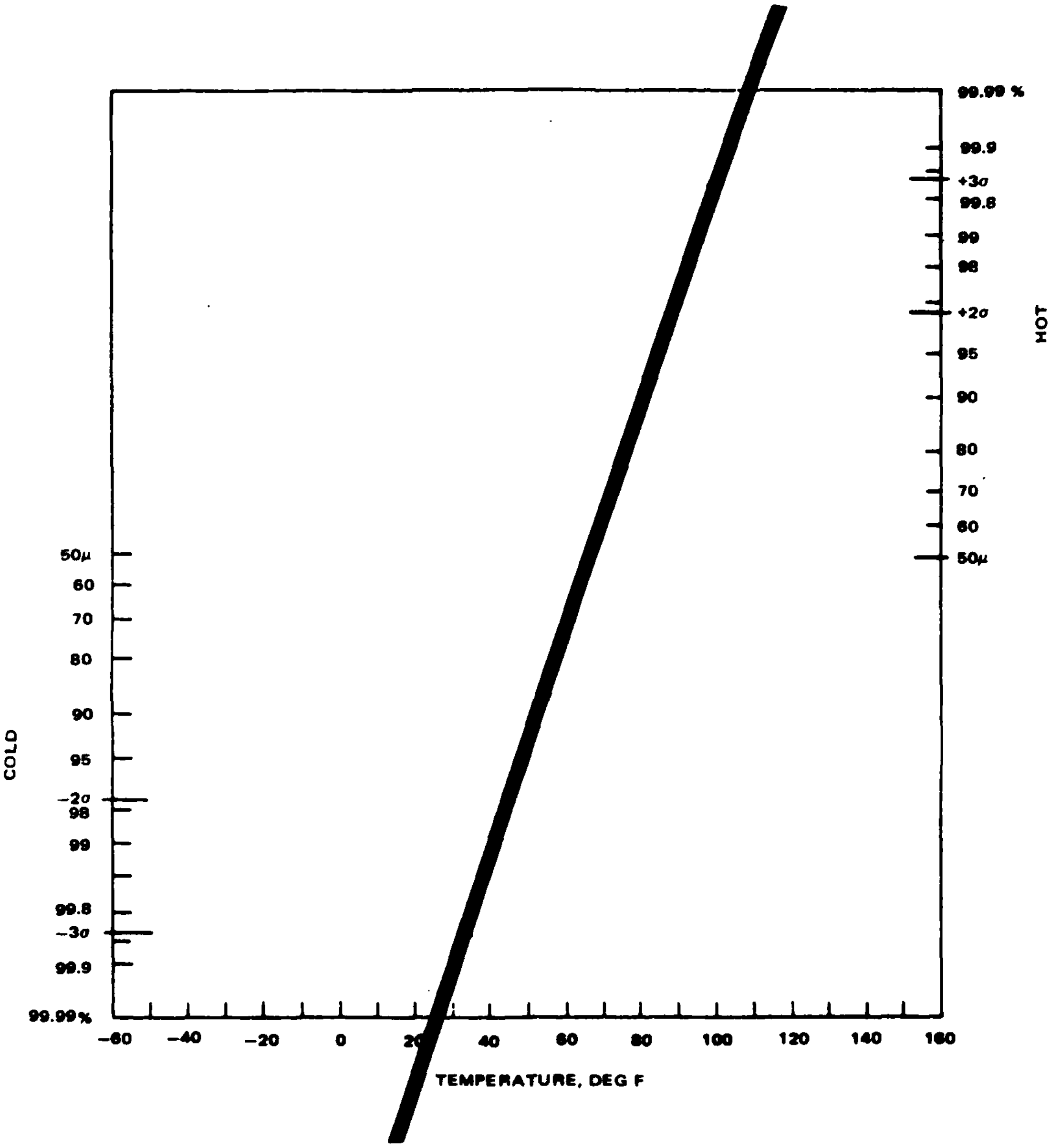

FIGURE 37. Composite of All Ships, All Levels, Gaussian.

Appendix A

DATA HANDLING

Temperature data from logbooks, monthly cards, and daily sheets are keypunched in formats as shown in Figure A-1 and the flow of data handling is as shown in Figure A-2.

The keypunched temperature data cards are pre-sorted per ship identification, year of the data, and deck level of the compartment or magazine from which the temperature data were taken.

The data cards are prepared as input to Program TTAPE which reads the input and writes the temperature data onto a digital magnetic tape (TTAPE Raw Data) and also prints out a set of tabulations showing the files written on this tape via UNIVAC 1110 computer. Data from each deck level represents a file, and a sample of the tabulation is shown in Figure A-3. All manipulations and reductions of the raw temperature data are done using the tape TTAPE.

Program TTEMP is then prepared with TTAPE as input and via the computer it sorts and counts the minimum and maximum daily temperature data into stalls of temperature data from -20 to 120°F at a 1-degree increment. This program outputs the temperature frequency data on punched cards and tabulations as shown in Figure A-4.

The temperature frequency data cards are then checked for obvious bad data points, if any, and eliminated prior to being prepared as input to Program CTAPE or Program FCON.

When the Program CTAPE option is used, the temperature frequency card data are written on a digital magnetic tape (CTAPE Frequency Data) and a list of files of CTAPE is printed out via the computer showing what

data (i.e., ship hull number, level, year of data, etc.) were written on what file of CTAPE. A sample of this list is shown in Figure A-5. Program CTAPE option is used when obtaining temperature frequency data which are summed or consolidated over many levels, many ships, and many years, such that manipulation of the tape input is more efficient and flexible in the computer usage than the handling of voluminous card input.

Program CCON is then prepared for the computer run using the magnetic tape CTAPE as input to compute the consolidated temperature frequency data. The computed data are similarly punched out on cards and printed out in tabulations as the Program TTEMP.

The consolidated temperature frequency data cards from Program CCON are then prepared as input to Program TEMPF, which takes this input and computes the cumulative frequency data and the cumulative probability data of the consolidated temperature data for minimum and maximum temperatures separately and for minimum and maximum temperatures combined. The program outputs plotted and tabulated data, as shown in Figure A-6.

Program FCON option is used when the temperature frequency data cards are relatively small in volume and the consolidation of the data is limited. The program then outputs the consolidated temperature frequency data cards and a set of tabulations listing the consolidated temperature frequency data.

The output cards from Program FCON are prepared as input to Program TEMPF to yield cumulative frequency and cumulative probability data of the consolidated temperature data as discussed above.

All plotted data presented in this publication are augmented with tabulated data and are available in the permanent file of the NWC Ordnance Test and Evaluation Division.

SAMPLE INPUT CARD
DATA FIELDS

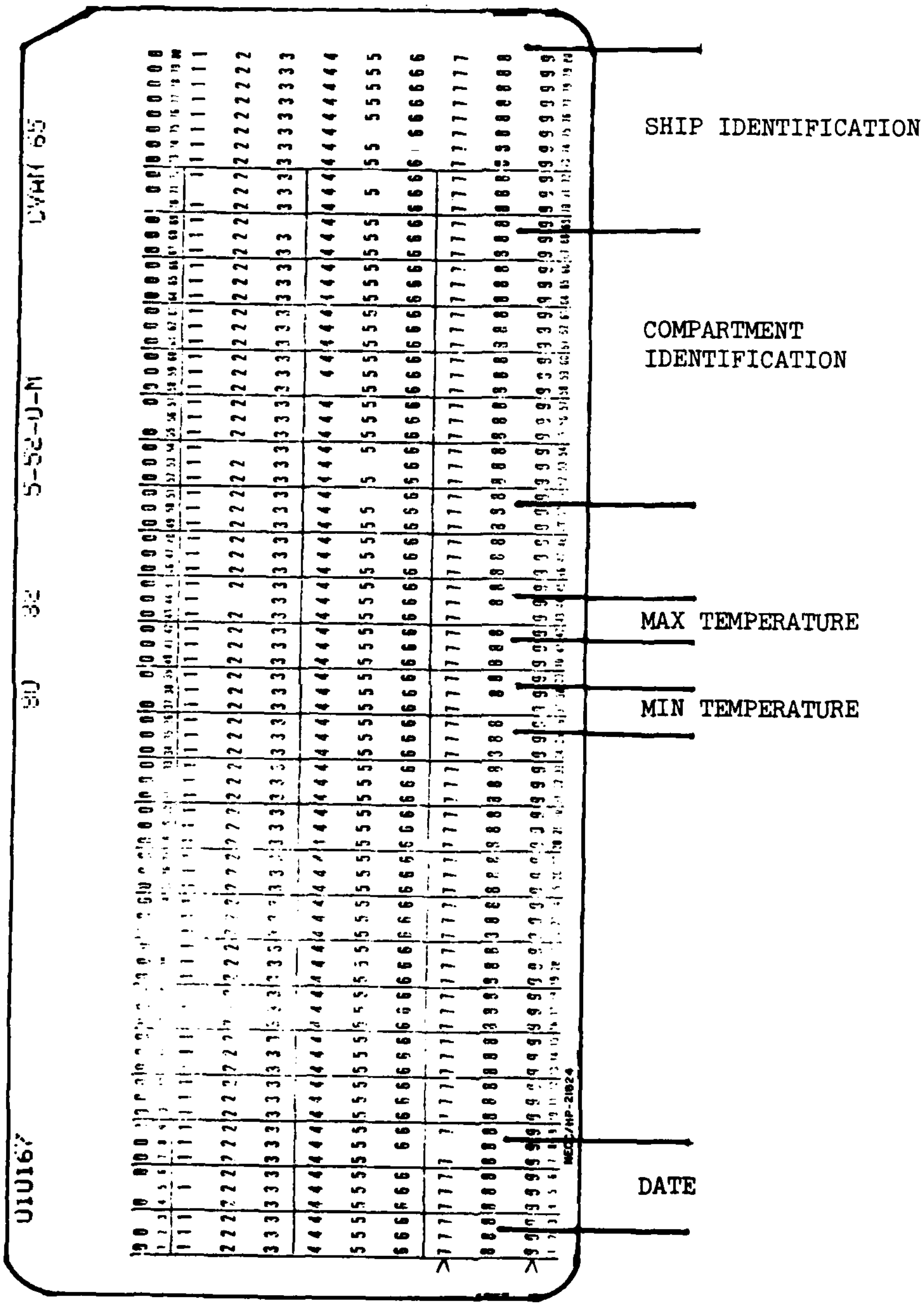

FIGURE A-1.

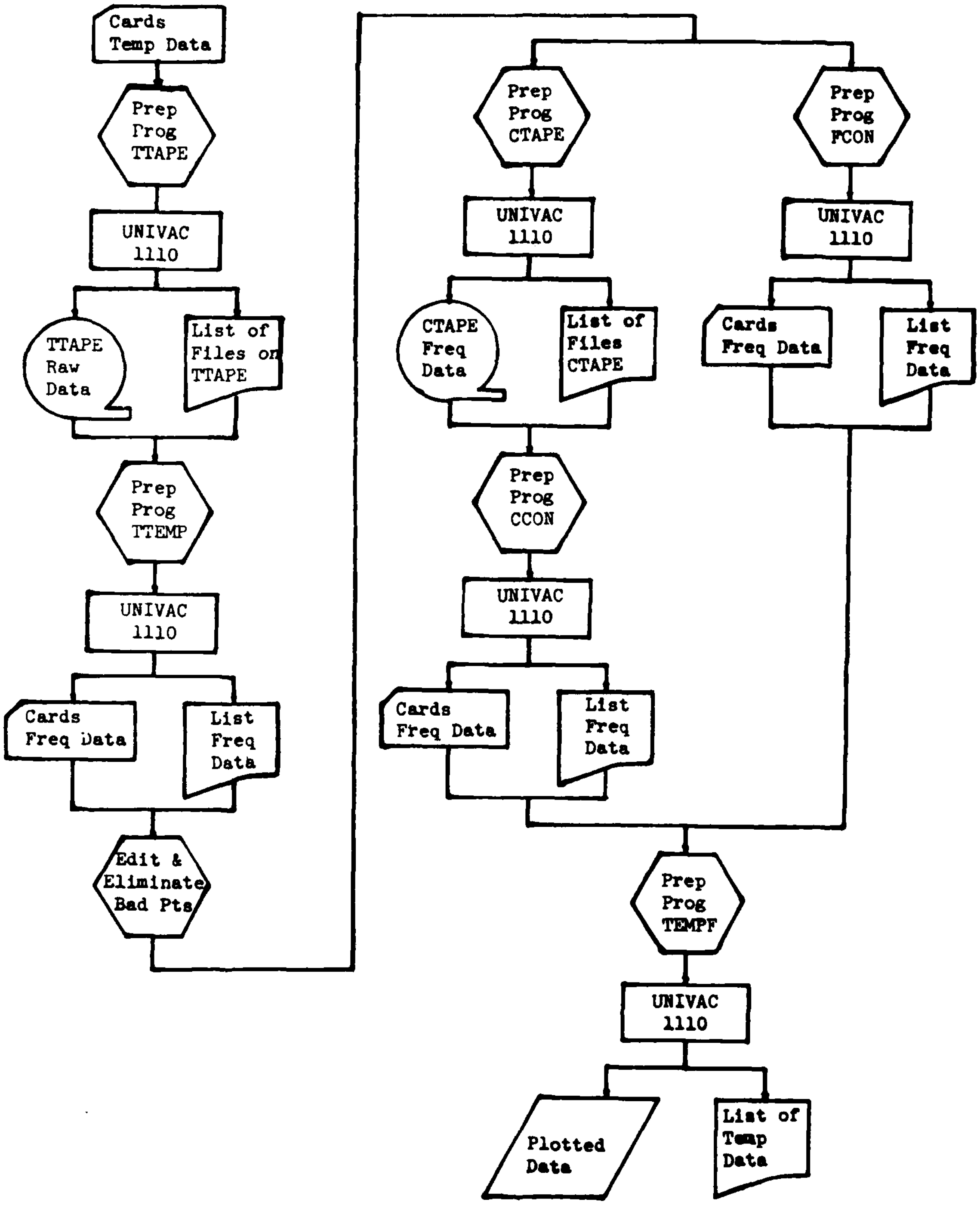
Cards
Temp Data
Prep
Prog
TTAPE
UNIVAC
1110
TTAPE
Raw
Data
List of
Files on
TTAPE
Prep
Prog
TTEMP
UNIVAC
1110
Cards
Freq Data
List
Freq
Data
Edit &
Eliminate
Bad Pts
Prep
Prog
CTAPE
UNIVAC
1110
CTAPE
Freq
Data
List of
Files
CTAPE
Prep
Prog
CCON
UNIVAC
1110
Cards
Freq Data
List
Freq
Data
Prep
Prog
FCON
UNIVAC
1110
Cards
Freq Data
List
Freq
Data
Prep
Prog
TEMPF
UNIVAC
1110
Plotted
Data
List of
Temp
Data

FIGURE A-2.

FILE NO.	LEVEL	HULL NO.	DATA PTS	YEAR	DATE OF RUN
13	03	CVAN-65	301	67	04/12/77
14	02	CVAN-65	173	67	04/12/77
15	01	CVAN-65	757	67	04/12/77
16	1	CVAN-65	807	67	04/12/77
17	1	CVAN-65	159	67	04/12/77
18	1	CVAN-65	152	67	04/12/77
19	1	CVAN-65	[illegible]	67	04/12/77
20	1	CVAN-65	168	67	04/12/77
21	2	CVAN-65	[illegible]	67	04/12/77
22	4	CVAN-65	2170	67	04/12/77
23	5	CVAN-65	2371	67	04/12/77
24	6	CVAN-65	2204	67	04/12/77
25	7	CVAN-65	1199	67	04/12/77

FIGURE A-3.

TAPE NO.: 3530 FILE NO.: 19 IDENTIFICATION: LEVEL 1 YR 67 CVAN-65 ON TAPE 04/12/77

MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
68	70	70	70	66	68	68	70	70	72	76	78	78	78	76	78	78	80	78	80
68	70	66	68	70	72	72	74	68	70	68	70	70	72	72	74	72	74	74	74
76	76	76	78	79	80	79	80	78	80	74	76	72	74	60	70	70	72	72	74
76	78	80	82	87	90	85	87	82	82	78	80	80	82	70	72	70	77	73	76
70	72	68	70	70	79	78	78	70	80	77	80	81	83	80	82	79	84	80	83
79	84	82	84	80	84	80	82	82	85	81	83	82	82	74	76	75	76	80	83
79	83	80	83	76	84	82	84	81	85	80	82	77	80	80	83	76	85	81	86
80	84	82	86	67	90	85	87	89	105	84	87	84	90	79	80	78	80	79	82
79	81	81	83	80	88	79	82	78	88	79	82	78	86	82	84	82	82	80	85
82	84	90	90	80	82	79	83	80	90	85	86	85	88	83	86	83	90	85	88
85	87	85	86	80	92	86	89	85	85	75	85	85	85	75	95	85	85	85	90
85	85	85	95	74	95	82	102	82	92	85	86	83	93	85	92	85	95	72	96
76	76																		

TMIN TOTAL DATA PTS: 120 NO. OF BAD PTS: 0 NO. OF DATA PTS USED: 120

TMAX TOTAL DATA PTS: 120 NO. OF BAD PTS: 0 NO. OF DATA PTS USED: 120

FIGURE A-4.

TAPE NO.: 3530 FILE NO.: 19 IDENTIFICATION: LEVEL 1 YR 67 CVAN-65 ON TAPE 04/12/77

FREQUENCY OF THIN SUB I

-20 DEG:	0	10 DEG:	0	40 DEG:	0	70 DEG:	10	100 DEG:	0
-19 DEG:	0	11 DEG:	0	41 DEG:	0	71 DEG:	0	101 DEG:	0
-18 DEG:	0	12 DEG:	0	42 DEG:	0	72 DEG:	6	102 DEG:	0
-17 DEG:	0	13 DEG:	0	43 DEG:	0	73 DEG:	1	103 DEG:	0
-16 DEG:	0	14 DEG:	0	44 DEG:	0	74 DEG:	4	104 DEG:	0
-15 DEG:	0	15 DEG:	0	45 DEG:	0	75 DEG:	3	105 DEG:	0
-14 DEG:	0	16 DEG:	0	46 DEG:	0	76 DEG:	6	106 DEG:	0
-13 DEG:	0	17 DEG:	0	47 DEG:	0	77 DEG:	2	107 DEG:	0
-12 DEG:	0	18 DEG:	0	48 DEG:	0	78 DEG:	10	108 DEG:	0
-11 DEG:	0	19 DEG:	0	49 DEG:	0	79 DEG:	11	109 DEG:	0
-10 DEG:	0	20 DEG:	0	50 DEG:	0	80 DEG:	16	110 DEG:	0
-9 DEG:	0	21 DEG:	0	51 DEG:	0	81 DEG:	5	111 DEG:	0
-8 DEG:	0	22 DEG:	0	52 DEG:	0	82 DEG:	11	112 DEG:	0
-7 DEG:	0	23 DEG:	0	53 DEG:	0	83 DEG:	4	113 DEG:	0
-6 DEG:	0	24 DEG:	0	54 DEG:	0	84 DEG:	2	114 DEG:	0
-5 DEG:	0	25 DEG:	0	55 DEG:	0	85 DEG:	15	115 DEG:	0
-4 DEG:	0	26 DEG:	0	56 DEG:	0	86 DEG:	1	116 DEG:	0
-3 DEG:	0	27 DEG:	0	57 DEG:	0	87 DEG:	2	117 DEG:	0
-2 DEG:	0	28 DEG:	0	58 DEG:	0	88 DEG:	0	118 DEG:	0
-1 DEG:	0	29 DEG:	0	59 DEG:	0	89 DEG:	1	119 DEG:	0
0 DEG:	0	30 DEG:	0	60 DEG:	1	90 DEG:	1	120 DEG:	0
1 DEG:	0	31 DEG:	0	61 DEG:	0	91 DEG:	0		
2 DEG:	0	32 DEG:	0	62 DEG:	0	92 DEG:	0		
3 DEG:	0	33 DEG:	0	63 DEG:	0	93 DEG:	0		
4 DEG:	0	34 DEG:	0	64 DEG:	0	94 DEG:	0		
5 DEG:	0	35 DEG:	0	65 DEG:	0	95 DEG:	0		
6 DEG:	0	36 DEG:	0	66 DEG:	2	96 DEG:	0		
7 DEG:	0	37 DEG:	0	67 DEG:	0	97 DEG:	0		
8 DEG:	0	38 DEG:	0	68 DEG:	6	98 DEG:	0		
9 DEG:	0	39 DEG:	0	69 DEG:	0	99 DEG:	0		

FIGURE A-4. (Contd.)

TAPE NO.: 3530 FILE NO.: 19 IDENTIFICATION: LEVEL 1 YR 67 CVAN-65 ON TAPE 04/12/77

FREQUENCY OF TMAX SUB I

-20 DEG:	0	10 DEG:	0	40 DEG:	0	70 DEG:	8	100 DEG:	0
-19 DEG:	0	11 DEG:	0	41 DEG:	0	71 DEG:	0	101 DEG:	0
-18 DEG:	0	12 DEG:	0	42 DEG:	0	72 DEG:	6	102 DEG:	1
-17 DEG:	0	13 DEG:	0	43 DEG:	0	73 DEG:	0	103 DEG:	0
-16 DEG:	0	14 DEG:	0	44 DEG:	0	74 DEG:	6	104 DEG:	0
-15 DEG:	0	15 DEG:	0	45 DEG:	0	75 DEG:	0	105 DEG:	1
-14 DEG:	0	16 DEG:	0	46 DEG:	0	76 DEG:	5	106 DEG:	0
-13 DEG:	0	17 DEG:	0	47 DEG:	0	77 DEG:	1	107 DEG:	0
-12 DEG:	0	18 DEG:	0	48 DEG:	0	78 DEG:	6	108 DEG:	0
-11 DEG:	0	19 DEG:	0	49 DEG:	0	79 DEG:	1	109 DEG:	0
-10 DEG:	0	20 DEG:	0	50 DEG:	0	80 DEG:	11	110 DEG:	0
-9 DEG:	0	21 DEG:	0	51 DEG:	0	81 DEG:	1	111 DEG:	0
-8 DEG:	0	22 DEG:	0	52 DEG:	0	82 DEG:	12	112 DEG:	0
-7 DEG:	0	23 DEG:	0	53 DEG:	0	83 DEG:	9	113 DEG:	0
-6 DEG:	0	24 DEG:	0	54 DEG:	0	84 DEG:	9	114 DEG:	0
-5 DEG:	0	25 DEG:	0	55 DEG:	0	85 DEG:	9	115 DEG:	0
-4 DEG:	0	26 DEG:	0	56 DEG:	0	86 DEG:	7	116 DEG:	0
-3 DEG:	0	27 DEG:	0	57 DEG:	0	87 DEG:	4	117 DEG:	0
-2 DEG:	0	28 DEG:	0	58 DEG:	0	88 DEG:	4	118 DEG:	0
-1 DEG:	0	29 DEG:	0	59 DEG:	0	89 DEG:	1	119 DEG:	0
0 DEG:	0	30 DEG:	0	60 DEG:	0	90 DEG:	7	120 DEG:	0
1 DEG:	0	31 DEG:	0	61 DEG:	0	91 DEG:	0		
2 DEG:	0	32 DEG:	0	62 DEG:	0	92 DEG:	3		
3 DEG:	0	33 DEG:	0	63 DEG:	0	93 DEG:	1		
4 DEG:	0	34 DEG:	0	64 DEG:	0	94 DEG:	0		
5 DEG:	0	35 DEG:	0	65 DEG:	0	95 DEG:	4		
6 DEG:	0	36 DEG:	0	66 DEG:	0	96 DEG:	1		
7 DEG:	0	37 DEG:	0	67 DEG:	0	97 DEG:	0		
8 DEG:	0	38 DEG:	0	68 DEG:	2	98 DEG:	0		
9 DEG:	0	39 DEG:	0	69 DEG:	0	99 DEG:	0		

FIGURE A-4. (Contd.).

TAPE NO.: 3530 FILE NO.: 19 IDENTIFICATION: LEVEL 1 YR 67 CVAN-65 ON TAPE 04/12/77

FREQUENCY OF (TMIN AND TMAX) SUB I

-20 DEG:	0	10 DEG:	0	40 DEG:	0	70 DEG:	18	100 DEG:	0
-19 DEG:	0	11 DEG:	0	41 DEG:	0	71 DEG:	0	101 DEG:	0
-18 DEG:	0	12 DEG:	0	42 DEG:	0	72 DEG:	12	102 DEG:	1
-17 DEG:	0	13 DEG:	0	43 DEG:	0	73 DEG:	1	103 DEG:	0
-16 DEG:	0	14 DEG:	0	44 DEG:	0	74 DEG:	10	104 DEG:	0
-15 DEG:	0	15 DEG:	0	45 DEG:	0	75 DEG:	3	105 DEG:	1
-14 DEG:	0	16 DEG:	0	46 DEG:	0	76 DEG:	11	106 DEG:	0
-13 DEG:	0	17 DEG:	0	47 DEG:	0	77 DEG:	3	107 DEG:	0
-12 DEG:	0	18 DEG:	0	48 DEG:	0	78 DEG:	16	108 DEG:	0
-11 DEG:	0	19 DEG:	0	49 DEG:	0	79 DEG:	12	109 DEG:	0
-10 DEG:	0	20 DEG:	0	50 DEG:	0	80 DEG:	27	110 DEG:	0
-9 DEG:	0	21 DEG:	0	51 DEG:	0	81 DEG:	6	111 DEG:	0
-8 DEG:	0	22 DEG:	0	52 DEG:	0	82 DEG:	23	112 DEG:	0
-7 DEG:	0	23 DEG:	0	53 DEG:	0	83 DEG:	13	113 DEG:	0
-6 DEG:	0	24 DEG:	0	54 DEG:	0	84 DEG:	11	114 DEG:	0
-5 DEG:	0	25 DEG:	0	55 DEG:	0	85 DEG:	24	115 DEG:	0
-4 DEG:	0	26 DEG:	0	56 DEG:	0	86 DEG:	8	116 DEG:	0
-3 DEG:	0	27 DEG:	0	57 DEG:	0	87 DEG:	6	117 DEG:	0
-2 DEG:	0	28 DEG:	0	58 DEG:	0	88 DEG:	4	118 DEG:	0
-1 DEG:	0	29 DEG:	0	59 DEG:	0	89 DEG:	2	119 DEG:	0
0 DEG:	0	30 DEG:	0	60 DEG:	1	90 DEG:	8	120 DEG:	0
1 DEG:	0	31 DEG:	0	61 DEG:	0	91 DEG:	0		
2 DEG:	0	32 DEG:	0	62 DEG:	0	92 DEG:	3		
3 DEG:	0	33 DEG:	0	63 DEG:	0	93 DEG:	1		
4 DEG:	0	34 DEG:	0	64 DEG:	0	94 DEG:	0		
5 DEG:	0	35 DEG:	0	65 DEG:	0	95 DEG:	4		
6 DEG:	0	36 DEG:	0	66 DEG:	2	96 DEG:	1		
7 DEG:	0	37 DEG:	0	67 DEG:	0	97 DEG:	0		
8 DEG:	0	38 DEG:	0	68 DEG:	8	98 DEG:	0		
9 DEG:	0	39 DEG:	0	69 DEG:	0	99 DEG:	0		

FIGURE A-4. (Contd.).

FILE NO.	FILE NO.	LEVEL	YR OF DATA	TAPE NO.	DATA FILE NO.	WRITTEN ON	DATE OF THIS RUN
52	CVAN-65	01	66	3540	3	04/12/77	03/10/78
53	CVAN-65	1	66	4540	4	04/12/77	03/10/78
54	CVAN-65	1	66	3540	5	04/12/77	03/10/78
55	CVAN-65	1	66	4540	6	04/12/77	03/10/78
56	CVAN-65	1	66	3540	7	04/12/77	03/10/78
57	CVAN-65	2	66	4540	8	04/12/77	03/10/78
58	CVAN-65	4	66	3540	9	04/12/77	03/10/78
59	CVAN-65	5	66	4540	10	04/12/77	03/10/78
60	CVAN-65	6	66	3540	11	04/12/77	03/10/78
61	CVAN-65	7	66	4540	12	04/12/77	03/10/78
62	CVAN-65	03	67	3540	13	04/12/77	03/10/78
63	CVAN-65	02	67	4540	14	04/12/77	03/10/78
64	CVAN-65	01	67	3540	15	04/12/77	03/10/78
65	CVAN-65	1	67	4540	16	04/12/77	03/10/78
66	CVAN-65	1	67	3540	17	04/12/77	03/10/78
67	CVAN-65	1	67	4540	18	04/12/77	03/10/78
68	CVAN-65	1	67	3540	19	04/12/77	03/10/78
69	CVAN-65	1	67	4540	20	04/12/77	03/10/78
70	CVAN-65	2	67	3540	21	04/12/77	03/10/78
71	CVAN-65	4	67	4540	22	04/12/77	03/10/78
72	CVAN-65	5	67	3530	23	04/12/77	03/10/78
73	CVAN-65	6	67	4540	24	04/12/77	03/10/78

FIGURE A-5.

TAPE NO.: 3530 FILE NO.: 19 IDENTIFICATION: LEVEL 1 YR 67 CVAN-65 ON TAPE 04/12/77

CUMULATIVE FREQUENCY UP TO TMIN SUB I

-20 DEG:	0	10 DEG:	0	40 DEG:	0	70 DEG:	19	100 DEG:	120
-19 DEG:	0	11 DEG:	0	41 DEG:	0	71 DEG:	19	101 DEG:	120
-18 DEG:	0	12 DEG:	0	42 DEG:	0	72 DEG:	25	102 DEG:	120
-17 DEG:	0	13 DEG:	0	43 DEG:	0	73 DEG:	26	103 DEG:	120
-16 DEG:	0	14 DEG:	0	44 DEG:	0	74 DEG:	30	104 DEG:	120
-15 DEG:	0	15 DEG:	0	45 DEG:	0	75 DEG:	33	105 DEG:	120
-14 DEG:	0	16 DEG:	0	46 DEG:	0	76 DEG:	39	106 DEG:	120
-13 DEG:	0	17 DEG:	0	47 DEG:	0	77 DEG:	41	107 DEG:	120
-12 DEG:	0	18 DEG:	0	48 DEG:	0	78 DEG:	51	108 DEG:	120
-11 DEG:	0	19 DEG:	0	49 DEG:	0	79 DEG:	62	109 DEG:	120
-10 DEG:	0	20 DEG:	0	50 DEG:	0	80 DEG:	78	110 DEG:	120
-9 DEG:	0	21 DEG:	0	51 DEG:	0	81 DEG:	83	111 DEG:	120
-8 DEG:	0	22 DEG:	0	52 DEG:	0	82 DEG:	94	112 DEG:	120
-7 DEG:	0	23 DEG:	0	53 DEG:	0	83 DEG:	98	113 DEG:	120
-6 DEG:	0	24 DEG:	0	54 DEG:	0	84 DEG:	100	114 DEG:	120
-5 DEG:	0	25 DEG:	0	55 DEG:	0	85 DEG:	115	115 DEG:	120
-4 DEG:	0	26 DEG:	0	56 DEG:	0	86 DEG:	116	116 DEG:	120
-3 DEG:	0	27 DEG:	0	57 DEG:	0	87 DEG:	118	117 DEG:	120
-2 DEG:	0	28 DEG:	0	58 DEG:	0	88 DEG:	118	118 DEG:	120
-1 DEG:	0	29 DEG:	0	59 DEG:	0	89 DEG:	119	119 DEG:	120
0 DEG:	0	30 DEG:	0	60 DEG:	1	90 DEG:	120	120 DEG:	120
1 DEG:	0	31 DEG:	0	61 DEG:	1	91 DEG:	120		
2 DEG:	0	32 DEG:	0	62 DEG:	1	92 DEG:	120		
3 DEG:	0	33 DEG:	0	63 DEG:	1	93 DEG:	120		
4 DEG:	0	34 DEG:	0	64 DEG:	1	94 DEG:	120		
5 DEG:	0	35 DEG:	0	65 DEG:	1	95 DEG:	120		
6 DEG:	0	36 DEG:	0	66 DEG:	3	96 DEG:	120		
7 DEG:	0	37 DEG:	0	67 DEG:	3	97 DEG:	120		
8 DEG:	0	38 DEG:	0	68 DEG:	9	98 DEG:	120		
9 DEG:	0	39 DEG:	0	69 DEG:	9	99 DEG:	120		

FIGURE A-6.

TAPE NO.: 3530 FILE NO.: 19 IDENTIFICATION: LEVEL 1 YR 67 CVAN-65 ON TAPE 04/12/77

CUMULATIVE FREQUENCY UP TO TMAX SUB I

-20 DEG:	0	10 DEG:	0	40 DEG:	0	70 DEG:	10	100 DEG:	118
-19 DEG:	0	11 DEG:	0	41 DEG:	0	71 DEG:	10	101 DEG:	118
-18 DEG:	0	12 DEG:	0	42 DEG:	0	72 DEG:	16	102 DEG:	119
-17 DEG:	0	13 DEG:	0	43 DEG:	0	73 DEG:	16	103 DEG:	119
-16 DEG:	0	14 DEG:	0	44 DEG:	0	74 DEG:	22	104 DEG:	119
-15 DEG:	0	15 DEG:	0	45 DEG:	0	75 DEG:	22	105 DEG:	120
-14 DEG:	0	16 DEG:	0	46 DEG:	0	76 DEG:	27	106 DEG:	120
-13 DEG:	0	17 DEG:	0	47 DEG:	0	77 DEG:	28	107 DEG:	120
-12 DEG:	0	18 DEG:	0	48 DEG:	0	78 DEG:	34	108 DEG:	120
-11 DEG:	0	19 DEG:	0	49 DEG:	0	79 DEG:	35	109 DEG:	120
-10 DEG:	0	20 DEG:	0	50 DEG:	0	80 DEG:	46	110 DEG:	120
-9 DEG:	0	21 DEG:	0	51 DEG:	0	81 DEG:	47	111 DEG:	120
-8 DEG:	0	22 DEG:	0	52 DEG:	0	82 DEG:	59	112 DEG:	120
-7 DEG:	0	23 DEG:	0	53 DEG:	0	83 DEG:	68	113 DEG:	120
-6 DEG:	0	24 DEG:	0	54 DEG:	0	84 DEG:	77	114 DEG:	120
-5 DEG:	0	25 DEG:	0	55 DEG:	0	85 DEG:	86	115 DEG:	120
-4 DEG:	0	26 DEG:	0	56 DEG:	0	86 DEG:	93	116 DEG:	120
-3 DEG:	0	27 DEG:	0	57 DEG:	0	87 DEG:	97	117 DEG:	120
-2 DEG:	0	28 DEG:	0	58 DEG:	0	88 DEG:	101	118 DEG:	120
-1 DEG:	0	29 DEG:	0	59 DEG:	0	89 DEG:	102	119 DEG:	120
0 DEG:	0	30 DEG:	0	60 DEG:	0	90 DEG:	109	120 DEG:	120
1 DEG:	0	31 DEG:	0	61 DEG:	0	91 DEG:	109		
2 DEG:	0	32 DEG:	0	62 DEG:	0	92 DEG:	112		
3 DEG:	0	33 DEG:	0	63 DEG:	0	93 DEG:	113		
4 DEG:	0	34 DEG:	0	64 DEG:	0	94 DEG:	113		
5 DEG:	0	35 DEG:	0	65 DEG:	0	95 DEG:	117		
6 DEG:	0	36 DEG:	0	66 DEG:	0	96 DEG:	118		
7 DEG:	0	37 DEG:	0	67 DEG:	0	97 DEG:	118		
8 DEG:	0	38 DEG:	0	68 DEG:	2	98 DEG:	118		
9 DEG:	0	39 DEG:	0	69 DEG:	2	99 DEG:	118		

FIGURE A-6. (Contd.)

TAPE NO.: 3530 FILE NO.: 19 IDENTIFICATION: LEVEL 1 YR 67 CVAN-65 ON TAPE 04/12/77

CUMULATIVE FREQUENCY UP TO (TMIN AND TMAX) SUB I

-20 DEG:	0	10 DEG:	0	40 DEG:	0	70 DEG:	29	100 DEG:	238
-19 DEG:	0	11 DEG:	0	41 DEG:	0	71 DEG:	29	101 DEG:	238
-18 DEG:	0	12 DEG:	0	42 DEG:	0	72 DEG:	41	102 DEG:	239
-17 DEG:	0	13 DEG:	0	43 DEG:	0	73 DEG:	42	103 DEG:	239
-16 DEG:	0	14 DEG:	0	44 DEG:	0	74 DEG:	52	104 DEG:	239
-15 DEG:	0	15 DEG:	0	45 DEG:	0	75 DEG:	55	105 DEG:	240
-14 DEG:	0	16 DEG:	0	46 DEG:	0	76 DEG:	66	106 DEG:	240
-13 DEG:	0	17 DEG:	0	47 DEG:	0	77 DEG:	69	107 DEG:	240
-12 DEG:	0	18 DEG:	0	48 DEG:	0	78 DEG:	85	108 DEG:	240
-11 DEG:	0	19 DEG:	0	49 DEG:	0	79 DEG:	97	109 DEG:	240
-10 DEG:	0	20 DEG:	0	50 DEG:	0	80 DEG:	124	110 DEG:	240
-9 DEG:	0	21 DEG:	0	51 DEG:	0	81 DEG:	130	111 DEG:	240
-8 DEG:	0	22 DEG:	0	52 DEG:	0	82 DEG:	153	112 DEG:	240
-7 DEG:	0	23 DEG:	0	53 DEG:	0	83 DEG:	166	113 DEG:	240
-6 DEG:	0	24 DEG:	0	54 DEG:	0	84 DEG:	177	114 DEG:	240
-5 DEG:	0	25 DEG:	0	55 DEG:	0	85 DEG:	201	115 DEG:	240
-4 DEG:	0	26 DEG:	0	56 DEG:	0	86 DEG:	209	116 DEG:	240
-3 DEG:	0	27 DEG:	0	57 DEG:	0	87 DEG:	215	117 DEG:	240
-2 DEG:	0	28 DEG:	0	58 DEG:	0	88 DEG:	219	118 DEG:	240
-1 DEG:	0	29 DEG:	0	59 DEG:	0	89 DEG:	221	119 DEG:	240
0 DEG:	0	30 DEG:	0	60 DEG:	1	90 DEG:	229	120 DEG:	240
1 DEG:	0	31 DEG:	0	61 DEG:	1	91 DEG:	229		
2 DEG:	0	32 DEG:	0	62 DEG:	1	92 DEG:	232		
3 DEG:	0	33 DEG:	0	63 DEG:	1	93 DEG:	233		
4 DEG:	0	34 DEG:	0	64 DEG:	1	94 DEG:	233		
5 DEG:	0	35 DEG:	0	65 DEG:	1	95 DEG:	237		
6 DEG:	0	36 DEG:	0	66 DEG:	3	96 DEG:	238		
7 DEG:	0	37 DEG:	0	67 DEG:	3	97 DEG:	238		
8 DEG:	0	38 DEG:	0	68 DEG:	11	98 DEG:	238		
9 DEG:	0	39 DEG:	0	69 DEG:	11	99 DEG:	238		

FIGURE A-6. (Contd.)

TAPE NO.: 3530 FILE NO.: 19 IDENTIFICATION: LEVEL 1 YR 67 CVAN-65 ON TAPE 04/12/77

PROBABILITY OF THIN SUB 1

-20 DEG:	.0000	10 DEG:	.0000	40 DEG:	.0000	70 DEG:	.0833	100 DEG:	.0000
-19 DEG:	.0000	11 DEG:	.0000	41 DEG:	.0000	71 DEG:	.0000	101 DEG:	.0000
-18 DEG:	.0000	12 DEG:	.0000	42 DEG:	.0000	72 DEG:	.0500	102 DEG:	.0000
-17 DEG:	.0000	13 DEG:	.0000	43 DEG:	.0000	73 DEG:	.0083	103 DEG:	.0000
-16 DEG:	.0000	14 DEG:	.0000	44 DEG:	.0000	74 DEG:	.0333	104 DEG:	.0000
-15 DEG:	.0000	15 DEG:	.0000	45 DEG:	.0000	75 DEG:	.0250	105 DEG:	.0000
-14 DEG:	.0000	16 DEG:	.0000	46 DEG:	.0000	76 DEG:	.0500	106 DEG:	.0000
-13 DEG:	.0000	17 DEG:	.0000	47 DEG:	.0000	77 DEG:	.0167	107 DEG:	.0000
-12 DEG:	.0000	18 DEG:	.0000	48 DEG:	.0000	78 DEG:	.0833	108 DEG:	.0000
-11 DEG:	.0000	19 DEG:	.0000	49 DEG:	.0000	79 DEG:	.0917	109 DEG:	.0000
-10 DEG:	.0000	20 DEG:	.0000	50 DEG:	.0000	80 DEG:	.1333	110 DEG:	.0000
-9 DEG:	.0000	21 DEG:	.0000	51 DEG:	.0000	81 DEG:	.0417	111 DEG:	.0000
-8 DEG:	.0000	22 DEG:	.0000	52 DEG:	.0000	82 DEG:	.0917	112 DEG:	.0000
-7 DEG:	.0000	23 DEG:	.0000	53 DEG:	.0000	83 DEG:	.0333	113 DEG:	.0000
-6 DEG:	.0000	24 DEG:	.0000	54 DEG:	.0000	84 DEG:	.0167	114 DEG:	.0000
-5 DEG:	.0000	25 DEG:	.0000	55 DEG:	.0000	85 DEG:	.1250	115 DEG:	.0000
-4 DEG:	.0000	26 DEG:	.0000	56 DEG:	.0000	86 DEG:	.0083	116 DEG:	.0000
-3 DEG:	.0000	27 DEG:	.0000	57 DEG:	.0000	87 DEG:	.0167	117 DEG:	.0000
-2 DEG:	.0000	28 DEG:	.0000	58 DEG:	.0000	88 DEG:	.0000	118 DEG:	.0000
-1 DEG:	.0000	29 DEG:	.0000	59 DEG:	.0000	89 DEG:	.0083	119 DEG:	.0000
0 DEG:	.0000	30 DEG:	.0000	60 DEG:	.0083	90 DEG:	.0083	120 DEG:	.0000
1 DEG:	.0000	31 DEG:	.0000	61 DEG:	.0000	91 DEG:	.0000		
2 DEG:	.0000	32 DEG:	.0000	62 DEG:	.0000	92 DEG:	.0000		
3 DEG:	.0000	33 DEG:	.0000	63 DEG:	.0000	93 DEG:	.0000		
4 DEG:	.0000	34 DEG:	.0000	64 DEG:	.0000	94 DEG:	.0000		
5 DEG:	.0000	35 DEG:	.0000	65 DEG:	.0000	95 DEG:	.0000		
6 DEG:	.0000	36 DEG:	.0000	66 DEG:	.0167	96 DEG:	.0000		
7 DEG:	.0000	37 DEG:	.0000	67 DEG:	.0000	97 DEG:	.0000		
8 DEG:	.0000	38 DEG:	.0000	68 DEG:	.0500	98 DEG:	.0000		
9 DEG:	.0000	39 DEG:	.0000	69 DEG:	.0000	99 DEG:	.0000		

FIGURE A-6. (Contd.)

TAPE NO.: 3530 FILE NO.: 19 IDENTIFICATION: LEVEL 1 YR 67 CVAN-65 ON TAPE 04/12/77

PROBABILITY OF TMAX SUB I

-20 DEG:	.0000	10 DEG:	.0000	40 DEG:	.0000	70 DEG:	.0667	100 DEG:	.0000
-19 DEG:	.0000	11 DEG:	.0000	41 DEG:	.0000	71 DEG:	.0000	101 DEG:	.0000
-18 DEG:	.0000	12 DEG:	.0000	42 DEG:	.0000	72 DEG:	.0500	102 DEG:	.0083
-17 DEG:	.0000	13 DEG:	.0000	43 DEG:	.0000	73 DEG:	.0000	103 DEG:	.0000
-16 DEG:	.0000	14 DEG:	.0000	44 DEG:	.0000	74 DEG:	.0500	104 DEG:	.0000
-15 DEG:	.0000	15 DEG:	.0000	45 DEG:	.0000	75 DEG:	.0000	105 DEG:	.0083
-14 DEG:	.0000	16 DEG:	.0000	46 DEG:	.0000	76 DEG:	.0417	106 DEG:	.0000
-13 DEG:	.0000	17 DEG:	.0000	47 DEG:	.0000	77 DEG:	.0083	107 DEG:	.0000
-12 DEG:	.0000	18 DEG:	.0000	48 DEG:	.0000	78 DEG:	.0500	108 DEG:	.0000
-11 DEG:	.0000	19 DEG:	.0000	49 DEG:	.0000	79 DEG:	.0083	109 DEG:	.0000
-10 DEG:	.0000	20 DEG:	.0000	50 DEG:	.0000	80 DEG:	.0917	110 DEG:	.0000
-9 DEG:	.0000	21 DEG:	.0000	51 DEG:	.0000	81 DEG:	.0083	111 DEG:	.0000
-8 DEG:	.0000	22 DEG:	.0000	52 DEG:	.0000	82 DEG:	.1000	112 DEG:	.0000
-7 DEG:	.0000	23 DEG:	.0000	53 DEG:	.0000	83 DEG:	.0750	113 DEG:	.0000
-6 DEG:	.0000	24 DEG:	.0000	54 DEG:	.0000	84 DEG:	.0750	114 DEG:	.0000
-5 DEG:	.0000	25 DEG:	.0000	55 DEG:	.0000	85 DEG:	.0750	115 DEG:	.0000
-4 DEG:	.0000	26 DEG:	.0000	56 DEG:	.0000	86 DEG:	.0583	116 DEG:	.0000
-3 DEG:	.0000	27 DEG:	.0000	57 DEG:	.0000	87 DEG:	.0333	117 DEG:	.0000
-2 DEG:	.0000	28 DEG:	.0000	58 DEG:	.0000	88 DEG:	.0333	118 DEG:	.0000
-1 DEG:	.0000	29 DEG:	.0000	59 DEG:	.0000	89 DEG:	.0083	119 DEG:	.0000
0 DEG:	.0000	30 DEG:	.0000	60 DEG:	.0000	90 DEG:	.0583	120 DEG:	.0000
1 DEG:	.0000	31 DEG:	.0000	61 DEG:	.0000	91 DEG:	.0000		
2 DEG:	.0000	32 DEG:	.0000	62 DEG:	.0000	92 DEG:	.0250		
3 DEG:	.0000	33 DEG:	.0000	63 DEG:	.0000	93 DEG:	.0083		
4 DEG:	.0000	34 DEG:	.0000	64 DEG:	.0000	94 DEG:	.0000		
5 DEG:	.0000	35 DEG:	.0000	65 DEG:	.0000	95 DEG:	.0333		
6 DEG:	.0000	36 DEG:	.0000	66 DEG:	.0000	96 DEG:	.0083		
7 DEG:	.0000	37 DEG:	.0000	67 DEG:	.0000	97 DEG:	.0000		
8 DEG:	.0000	38 DEG:	.0000	68 DEG:	.0167	98 DEG:	.0000		
9 DEG:	.0000	39 DEG:	.0000	69 DEG:	.0000	99 DEG:	.0000		

FIGURE A-6. (Contd.)

TAPE NO.: 3530 FILE NO.: 19 IDENTIFICATION: LEVEL 1 YR 67 CVAN-65 ON TAPE 04/12/77

PROBABILITY OF (TMIN AND TMAX) SUB I

-20 DEG:	.0000	10 DEG:	.0000	40 DEG:	.0000	70 DEG:	.0750	100 DEG:	.0000
-19 DEG:	.0000	11 DEG:	.0000	41 DEG:	.0000	71 DEG:	.0000	101 DEG:	.0000
-18 DEG:	.0000	12 DEG:	.0000	42 DEG:	.0000	72 DEG:	.0500	102 DEG:	.0042
-17 DEG:	.0000	13 DEG:	.0000	43 DEG:	.0000	73 DEG:	.0042	103 DEG:	.0000
-16 DEG:	.0000	14 DEG:	.0000	44 DEG:	.0000	74 DEG:	.0417	104 DEG:	.0000
-15 DEG:	.0000	15 DEG:	.0000	45 DEG:	.0000	75 DEG:	.0125	105 DEG:	.0042
-14 DEG:	.0000	16 DEG:	.0000	46 DEG:	.0000	76 DEG:	.0458	106 DEG:	.0000
-13 DEG:	.0000	17 DEG:	.0000	47 DEG:	.0000	77 DEG:	.0125	107 DEG:	.0000
-12 DEG:	.0000	18 DEG:	.0000	48 DEG:	.0000	78 DEG:	.0667	108 DEG:	.0000
-11 DEG:	.0000	19 DEG:	.0000	49 DEG:	.0000	79 DEG:	.0500	109 DEG:	.0000
-10 DEG:	.0000	20 DEG:	.0000	50 DEG:	.0000	80 DEG:	.1125	110 DEG:	.0000
-9 DEG:	.0000	21 DEG:	.0000	51 DEG:	.0000	81 DEG:	.0250	111 DEG:	.0000
-8 DEG:	.0000	22 DEG:	.0000	52 DEG:	.0000	82 DEG:	.0958	112 DEG:	.0000
-7 DEG:	.0000	23 DEG:	.0000	53 DEG:	.0000	83 DEG:	.0542	113 DEG:	.0000
-6 DEG:	.0000	24 DEG:	.0000	54 DEG:	.0000	84 DEG:	.0458	114 DEG:	.0000
-5 DEG:	.0000	25 DEG:	.0000	55 DEG:	.0000	85 DEG:	.1000	115 DEG:	.0000
-4 DEG:	.0000	26 DEG:	.0000	56 DEG:	.0000	86 DEG:	.0333	116 DEG:	.0000
-3 DEG:	.0000	27 DEG:	.0000	57 DEG:	.0000	87 DEG:	.0250	117 DEG:	.0000
-2 DEG:	.0000	28 DEG:	.0000	58 DEG:	.0000	88 DEG:	.0167	118 DEG:	.0000
-1 DEG:	.0000	29 DEG:	.0000	59 DEG:	.0000	89 DEG:	.0083	119 DEG:	.0000
0 DEG:	.0000	30 DEG:	.0000	60 DEG:	.0042	90 DEG:	.0333	120 DEG:	.0000
1 DEG:	.0000	31 DEG:	.0000	61 DEG:	.0000	91 DEG:	.0000		
2 DEG:	.0000	32 DEG:	.0000	62 DEG:	.0000	92 DEG:	.0125		
3 DEG:	.0000	33 DEG:	.0000	63 DEG:	.0000	93 DEG:	.0042		
4 DEG:	.0000	34 DEG:	.0000	64 DEG:	.0000	94 DEG:	.0000		
5 DEG:	.0000	35 DEG:	.0000	65 DEG:	.0000	95 DEG:	.0167		
6 DEG:	.0000	36 DEG:	.0000	66 DEG:	.0083	96 DEG:	.0042		
7 DEG:	.0000	37 DEG:	.0000	67 DEG:	.0000	97 DEG:	.0000		
8 DEG:	.0000	38 DEG:	.0000	68 DEG:	.0333	98 DEG:	.0000		
9 DEG:	.0000	39 DEG:	.0000	69 DEG:	.0000	99 DEG:	.0000		

FIGURE A-6. (Contd.)

TAPE NO.: 3530 FILE NO.: 19 IDENTIFICATION: LEVEL 1 YR 67 CVAN-65 ON TAPE 04/12/77

CUMULATIVE PROBABILITY UP TO TMIN SUB I

-20 DEG:	.0000	10 DEG:	.0000	40 DEG:	.0000	70 DEG:	.1583	100 DEG:	1.0000
-19 DEG:	.0000	11 DEG:	.0000	41 DEG:	.0000	71 DEG:	.1583	101 DEG:	1.0000
-18 DEG:	.0000	12 DEG:	.0000	42 DEG:	.0000	72 DEG:	.2083	102 DEG:	1.0000
-17 DEG:	.0000	13 DEG:	.0000	43 DEG:	.0000	73 DEG:	.2167	103 DEG:	1.0000
-16 DEG:	.0000	14 DEG:	.0000	44 DEG:	.0000	74 DEG:	.2500	104 DEG:	1.0000
-15 DEG:	.0000	15 DEG:	.0000	45 DEG:	.0000	75 DEG:	.2750	105 DEG:	1.0000
-14 DEG:	.0000	16 DEG:	.0000	46 DEG:	.0000	76 DEG:	.3250	106 DEG:	1.0000
-13 DEG:	.0000	17 DEG:	.0000	47 DEG:	.0000	77 DEG:	.3417	107 DEG:	1.0000
-12 DEG:	.0000	18 DEG:	.0000	48 DEG:	.0000	78 DEG:	.4250	108 DEG:	1.0000
-11 DEG:	.0000	19 DEG:	.0000	49 DEG:	.0000	79 DEG:	.5167	109 DEG:	1.0000
-10 DEG:	.0000	20 DEG:	.0000	50 DEG:	.0000	80 DEG:	.6500	110 DEG:	1.0000
-9 DEG:	.0000	21 DEG:	.0000	51 DEG:	.0000	81 DEG:	.6917	111 DEG:	1.0000
-8 DEG:	.0000	22 DEG:	.0000	52 DEG:	.0000	82 DEG:	.7833	112 DEG:	1.0000
-7 DEG:	.0000	23 DEG:	.0000	53 DEG:	.0000	83 DEG:	.8167	113 DEG:	1.0000
-6 DEG:	.0000	24 DEG:	.0000	54 DEG:	.0000	84 DEG:	.8333	114 DEG:	1.0000
-5 DEG:	.0000	25 DEG:	.0000	55 DEG:	.0000	85 DEG:	.9583	115 DEG:	1.0000
-4 DEG:	.0000	26 DEG:	.0000	56 DEG:	.0000	86 DEG:	.9667	116 DEG:	1.0000
-3 DEG:	.0000	27 DEG:	.0000	57 DEG:	.0000	87 DEG:	.9833	117 DEG:	1.0000
-2 DEG:	.0000	28 DEG:	.0000	58 DEG:	.0000	88 DEG:	.9833	118 DEG:	1.0000
-1 DEG:	.0000	29 DEG:	.0000	59 DEG:	.0000	89 DEG:	.9917	119 DEG:	1.0000
0 DEG:	.0000	30 DEG:	.0000	60 DEG:	.0083	90 DEG:	1.0000	120 DEG:	1.0000
1 DEG:	.0000	31 DEG:	.0000	61 DEG:	.0083	91 DEG:	1.0000		
2 DEG:	.0000	32 DEG:	.0000	62 DEG:	.0083	92 DEG:	1.0000		
3 DEG:	.0000	33 DEG:	.0000	63 DEG:	.0083	93 DEG:	1.0000		
4 DEG:	.0000	34 DEG:	.0000	64 DEG:	.0083	94 DEG:	1.0000		
5 DEG:	.0000	35 DEG:	.0000	65 DEG:	.0083	95 DEG:	1.0000		
6 DEG:	.0000	36 DEG:	.0000	66 DEG:	.0250	96 DEG:	1.0000		
7 DEG:	.0000	37 DEG:	.0000	67 DEG:	.0250	97 DEG:	1.0000		
8 DEG:	.0000	38 DEG:	.0000	68 DEG:	.0750	98 DEG:	1.0000		
9 DEG:	.0000	39 DEG:	.0000	69 DEG:	.0750	99 DEG:	1.0000		

FIGURE A-6. (Contd.)

TAPE NO.: 3530 FILE NO.: 19 IDENTIFICATION: LEVEL 1 YR 67 CVAN-65 ON TAPE 04/12/77

CUMULATIVE PROBABILITY UP TO TMAX SUB I

-20 DEG:	.0000	10 DEG:	.0000	40 DEG:	.0000	70 DEG:	.0833	100 DEG:	.9833
-19 DEG:	.0000	11 DEG:	.0000	41 DEG:	.0000	71 DEG:	.0833	101 DEG:	.9833
-18 DEG:	.0000	12 DEG:	.0000	42 DEG:	.0000	72 DEG:	.1333	102 DEG:	.9917
-17 DEG:	.0000	13 DEG:	.0000	43 DEG:	.0000	73 DEG:	.1333	103 DEG:	.9917
-16 DEG:	.0000	14 DEG:	.0000	44 DEG:	.0000	74 DEG:	.1833	104 DEG:	.9917
-15 DEG:	.0000	15 DEG:	.0000	45 DEG:	.0000	75 DEG:	.1833	105 DEG:	1.0000
-14 DEG:	.0000	16 DEG:	.0000	46 DEG:	.0000	76 DEG:	.2250	106 DEG:	1.0000
-13 DEG:	.0000	17 DEG:	.0000	47 DEG:	.0000	77 DEG:	.2333	107 DEG:	1.0000
-12 DEG:	.0000	18 DEG:	.0000	48 DEG:	.0000	78 DEG:	.2833	108 DEG:	1.0000
-11 DEG:	.0000	19 DEG:	.0000	49 DEG:	.0000	79 DEG:	.2917	109 DEG:	1.0000
-10 DEG:	.0000	20 DEG:	.0000	50 DEG:	.0000	80 DEG:	.3833	110 DEG:	1.0000
-9 DEG:	.0000	21 DEG:	.0000	51 DEG:	.0000	81 DEG:	.3917	111 DEG:	1.0000
-8 DEG:	.0000	22 DEG:	.0000	52 DEG:	.0000	82 DEG:	.4917	112 DEG:	1.0000
-7 DEG:	.0000	23 DEG:	.0000	53 DEG:	.0000	83 DEG:	.5667	113 DEG:	1.0000
-6 DEG:	.0000	24 DEG:	.0000	54 DEG:	.0000	84 DEG:	.6417	114 DEG:	1.0000
-5 DEG:	.0000	25 DEG:	.0000	55 DEG:	.0000	85 DEG:	.7167	115 DEG:	1.0000
-4 DEG:	.0000	26 DEG:	.0000	56 DEG:	.0000	86 DEG:	.7750	116 DEG:	1.0000
-3 DEG:	.0000	27 DEG:	.0000	57 DEG:	.0000	87 DEG:	.8083	117 DEG:	1.0000
-2 DEG:	.0000	28 DEG:	.0000	58 DEG:	.0000	88 DEG:	.8417	118 DEG:	1.0000
-1 DEG:	.0000	29 DEG:	.0000	59 DEG:	.0000	89 DEG:	.8500	119 DEG:	1.0000
0 DEG:	.0000	30 DEG:	.0000	60 DEG:	.0000	90 DEG:	.9083	120 DEG:	1.0000
1 DEG:	.0000	31 DEG:	.0000	61 DEG:	.0000	91 DEG:	.9083		
2 DEG:	.0000	32 DEG:	.0000	62 DEG:	.0000	92 DEG:	.9333		
3 DEG:	.0000	33 DEG:	.0000	63 DEG:	.0000	93 DEG:	.9417		
4 DEG:	.0000	34 DEG:	.0000	64 DEG:	.0000	94 DEG:	.9417		
5 DEG:	.0000	35 DEG:	.0000	65 DEG:	.0000	95 DEG:	.9750		
6 DEG:	.0000	36 DEG:	.0000	66 DEG:	.0000	96 DEG:	.9833		
7 DEG:	.0000	37 DEG:	.0000	67 DEG:	.0000	97 DEG:	.9833		
8 DEG:	.0000	38 DEG:	.0000	68 DEG:	.0167	98 DEG:	.9833		
9 DEG:	.0000	39 DEG:	.0000	69 DEG:	.0167	99 DEG:	.9833		

FIGURE A-6. (Contd.)

TAPE NO.: 3530 FILE NO.: 19 IDENTIFICATION: LEVEL 1 YR 67 CVAN-65 ON TAPE 04/12/77

CUMULATIVE PROBABILITY UP TO (TMIN AND TMAX) SUB I

-20 DEG:	.0000	10 DEG:	.0000	40 DEG:	.0000	70 DEG:	.1208	100 DEG:	.9917
-19 DEG:	.0000	11 DEG:	.0000	41 DEG:	.0000	71 DEG:	.1208	101 DEG:	.9917
-18 DEG:	.0000	12 DEG:	.0000	42 DEG:	.0000	72 DEG:	.1708	102 DEG:	.9958
-17 DEG:	.0000	13 DEG:	.0000	43 DEG:	.0000	73 DEG:	.1750	103 DEG:	.9958
-16 DEG:	.0000	14 DEG:	.0000	44 DEG:	.0000	74 DEG:	.2167	104 DEG:	.9958
-15 DEG:	.0000	15 DEG:	.0000	45 DEG:	.0000	75 DEG:	.2292	105 DEG:	1.0000
-14 DEG:	.0000	16 DEG:	.0000	46 DEG:	.0000	76 DEG:	.2750	106 DEG:	1.0000
-13 DEG:	.0000	17 DEG:	.0000	47 DEG:	.0000	77 DEG:	.2875	107 DEG:	1.0000
-12 DEG:	.0000	18 DEG:	.0000	48 DEG:	.0000	78 DEG:	.3542	108 DEG:	1.0000
-11 DEG:	.0000	19 DEG:	.0000	49 DEG:	.0000	79 DEG:	.4042	109 DEG:	1.0000
-10 DEG:	.0000	20 DEG:	.0000	50 DEG:	.0000	80 DEG:	.5167	110 DEG:	1.0000
-9 DEG:	.0000	21 DEG:	.0000	51 DEG:	.0000	81 DEG:	.5417	111 DEG:	1.0000
-8 DEG:	.0000	22 DEG:	.0000	52 DEG:	.0000	82 DEG:	.6375	112 DEG:	1.0000
-7 DEG:	.0000	23 DEG:	.0000	53 DEG:	.0000	83 DEG:	.6917	113 DEG:	1.0000
-6 DEG:	.0000	24 DEG:	.0000	54 DEG:	.0000	84 DEG:	.7375	114 DEG:	1.0000
-5 DEG:	.0000	25 DEG:	.0000	55 DEG:	.0000	85 DEG:	.8375	115 DEG:	1.0000
-4 DEG:	.0000	26 DEG:	.0000	56 DEG:	.0000	86 DEG:	.8708	116 DEG:	1.0000
-3 DEG:	.0000	27 DEG:	.0000	57 DEG:	.0000	87 DEG:	.8958	117 DEG:	1.0000
-2 DEG:	.0000	28 DEG:	.0000	58 DEG:	.0000	88 DEG:	.9125	118 DEG:	1.0000
-1 DEG:	.0000	29 DEG:	.0000	59 DEG:	.0000	89 DEG:	.9208	119 DEG:	1.0000
0 DEG:	.0000	30 DEG:	.0000	60 DEG:	.0042	90 DEG:	.9542	120 DEG:	1.0000
1 DEG:	.0000	31 DEG:	.0000	61 DEG:	.0042	91 DEG:	.9542		
2 DEG:	.0000	32 DEG:	.0000	62 DEG:	.0042	92 DEG:	.9667		
3 DEG:	.0000	33 DEG:	.0000	63 DEG:	.0042	93 DEG:	.9708		
4 DEG:	.0000	34 DEG:	.0000	64 DEG:	.0042	94 DEG:	.9708		
5 DEG:	.0000	35 DEG:	.0000	65 DEG:	.0042	95 DEG:	.9875		
6 DEG:	.0000	36 DEG:	.0000	66 DEG:	.0125	96 DEG:	.9917		
7 DEG:	.0000	37 DEG:	.0000	67 DEG:	.0125	97 DEG:	.9917		
8 DEG:	.0000	38 DEG:	.0000	68 DEG:	.0458	98 DEG:	.9917		
9 DEG:	.0000	39 DEG:	.0000	69 DEG:	.0458	99 DEG:	.9917		

FIGURE A-6. (Contd.)

Appendix B

DEFINITIONS OF DATA

Data presented in Figure A-3 are defined in the following:

TAPE NO. is the tape number identifying the tape that temperature data are written on.

FILE NO. is the file number of the tape that the data are written on.

IDENTIFICATION gives the deck level of the ship from which the data were obtained, the year of the data, the hull number of the ship, and the date the data were written on this tape.

MIN column gives the daily minimum temperature data.

MAX column gives the daily maximum temperature data.

TMIN TOTAL DATA PTS gives the total number of daily minimum temperature data available on this file.

TMAX TOTAL DATA PTS gives the total number of daily maximum temperature data available on this file.

NO. OF BAD PTS gives the number of daily minimum or maximum temperature data that were lower than -20°F or greater than 120°F.

NO. OF DATA PTS USED gives the number of daily minimum or maximum temperature data that were used in the compilation of the frequency data.

FREQUENCY OF TMIN SUB I gives the frequencies of the daily minimum temperature data from -20 to 120°F at 1-degree intervals and denoted $N_{t_{min_i}}$.

FREQUENCY OF TMAX SUB I gives the frequencies of the daily maximum temperature data from -20 to 120°F at 1-degree intervals and denoted $N_{t_{max_i}}$.

FREQUENCY OF (TMAX AND TMIN) SUB I gives the frequencies of the daily minimum and maximum, combined, temperature data from -20 to 120°F at 1-degree intervals and denoted $N_{(t_{min_i} \text{ and } t_{max_i})}$.

Data presented in Figure A-6 are defined in the following:

CUMULATIVE FREQUENCY UP TO TMIN SUB I gives the cumulative frequencies of the daily minimum temperature from -20°F up to minimum temperature of interest and denoted $NCF_{t_{min_i}}$.

$$NCF_{t_{min_i}} = \sum_{j}^{k} N_{t_{min_i}}$$, where $N_{t_{min_j}}$ is the frequency of

-20°F temperature and $N_{t_{min_k}}$ is the frequency of temperature of interest.

CUMULATIVE FREQUENCY UP TO TMAX SUB I denoted $NCF_{t_{max_i}}$ is defined as follows:

$$NCF_{t_{max_i}} = \sum_{j}^{k} N_{(t_{min_i} \text{ and } t_{max_i})}$$

PROBABILITY OF TMIN SUB I denoted $P(t_{max_i})$ defined as follows:

$$P(t_{min_i}) = \frac{N_{t_{min_i}}}{N_{t_{min_{total}}}}$$, where $N_{t_{min_{total}}}$ is the total number of

daily minimum temperature data used.

PROBABILITY OF TMAX SUB I denoted $P(t_{max_i})$ is defined as follows:

$$P(t_{max_i}) = \frac{N_{t_{max_i}}}{N_{t_{max_{total}}}}$$

PROBABILITY OF (TMIN AND TMAX) SUB I denoted $P(t_{min_i}$ and $t_{max_i})$ is defined as follows:

$$P(t_{min_i} \text{ and } t_{max_i}) = \frac{N(t_{min_i} \text{ and } t_{max_i})}{N_{t_{min_{total}}} + N_{t_{max_{total}}}}$$

CUMULATIVE PROBABILITY UP TO TMIN SUB I denoted $Pc(t_{min_i})$ gives the cumulative probabilities of the daily minimum temperature from -20°F up to minimum temperature of interest. It is defined as follows:

$$Pc(t_{min_i}) = \sum_{j}^{k} \frac{N_{t_{min_i}}}{N_{t_{min_{total}}}}$$

CUMULATIVE PROBABILITY UP TO TMAX SUB I denoted $Pc(t_{max_i})$ is defined as follows:

$$Pc(t_{max_i}) = \sum_{j}^{k} \frac{N_{t_{max_i}}}{N_{t_{max_{total}}}}$$

CUMULATIVE PROBABILITY UP TO (TMIN AND TMAX) SUB I denoted

$$Pc(t_{min_i} \text{ and } t_{max_i}) = \sum_{j}^{k} \frac{N(t_{min_i} \text{ and } t_{max_i})}{N_{t_{min_{total}}} + N_{t_{max_{total}}}}$$

Appendix C

EXPLANATION OF DECK LEVEL AND COMPARTMENT IDENTIFICATIONS[1]

The various decks of a ship are numbered, using the main deck as a baseline. On all ships except aircraft carriers, the main deck is the upper most deck that runs the length of the ship; on aircraft carriers the hangar deck is the baseline. Below the main deck are the second deck, third deck, etc. Above the main deck are the 01 (pronounced oh one) level, 02 level, etc.

Two systems of compartment numbering are presently in use, but only the newer system (begun in March 1949) is described here. Compartments are designated by a grouping of various letters and numbers, separated by hyphens. Each compartment is designated by its deck number, frame number (starting at zero at the bow and increasing towards aft), relation to ship's centerline, and usage. An example of this numbering system is 3-75-4-M. The 3 indicates the third deck; the 75 indicates that the forward boundary of the compartment is at frame 75; the 4 indicates that it is on the port of the ship (an odd number would indicate starboard side); and the M indicates that the compartment is used as a magazine. Other compartment designations are A for storage spaces, C for control spaces (areas normally manned, such as CIC communications spaces, and the pilot house), E for engineering spaces, F for fuel storage, Q for miscellaneous spaces (shops, offices, laundry, and galley), T for vertical access trunks, and L for living (berthing) spaces.

[3]General Guide for Shipboard Visitors, Naval Weapons Center, China Lake, Calif.

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 F-18 Program Engineering (1)
 A. S. Torgerson (1)
 B. Dighton (1)
 W. J. Stampley (1)
 J. P. Capellupo (1)
 L. W. Guenther (1)
 GIDEP Representative (1)
1 Marquardt Corporation, Van Nuys, CA
2 Martin-Marietta Corporation, Denver, CO
 Reliability (1)
 Technical Library (1)
2 North American Rockwell Corporation, Columbus, OH
 Engineering Development Laboratories (1)
 Technical Library (1)
2 Raytheon Company, Waltham, MA
 Missile Systems (1)
 Technical Library (1)
2 Rocketdyne International Corporation, Rocketdyne Division, Canoga Park, CA
 A. Kohl (1)
 Technical Library (1)
1 Rocketdyne, A Division of North American Rockwell Corporation, McGregor, TX (Technical Library)
1 Rockwell International Corporation, Los Angeles, CA (Technical Library)
1 Rohm and Haas Company, Huntsville, AL
3 Sandia Corporation, Albuquerque, NM
 Section 1541, Jerry T. Foley (2)
 Section 1543, Mark B. Gens (1)
3 Sandia Corporation, Livermore, CA
 C. A. Scott (2)
 Technical Library (1)
4 Texas Instruments, Inc., Dallas, TX
 B. Hatfield (1)
 J. Leslie (1)
 P. Watts, MS 296 (1)
 Technical Library (1)
4 The Boeing Company, Seattle, WA
 S. Barber, MS 8609 (1)
 F. P. Stevens, Standards Control (1)
 J. Stuart, MS 47-06 (1)
 Technical Library (1)
4 The Martin-Marietta Corporation, Newton, PA
 Engineering Library MP-30 (2)
 Code 143, J. A. Roy (1)
 Technical Library (1)
1 Thiokol Chemical Corporation, Newton, PA
1 Thiokol Chemical Corporation, Wasatch Division, Brigham City, UT
1 United Technologies, Chemical Systems Division, Sunnyvale, CA

2 Value Engineering Company, Alexandria, VA
J. Toomey (1)
Oxnard Plant (1)
4 Vought Corporation, Systems Division, Dallas, TX
R. N. Hancock, Unit 2-53483 (2)
C. T. Morrow, P. O. Box 6144 (1)
Technical Library (1)